NEWS OF DEVELOPMENTS

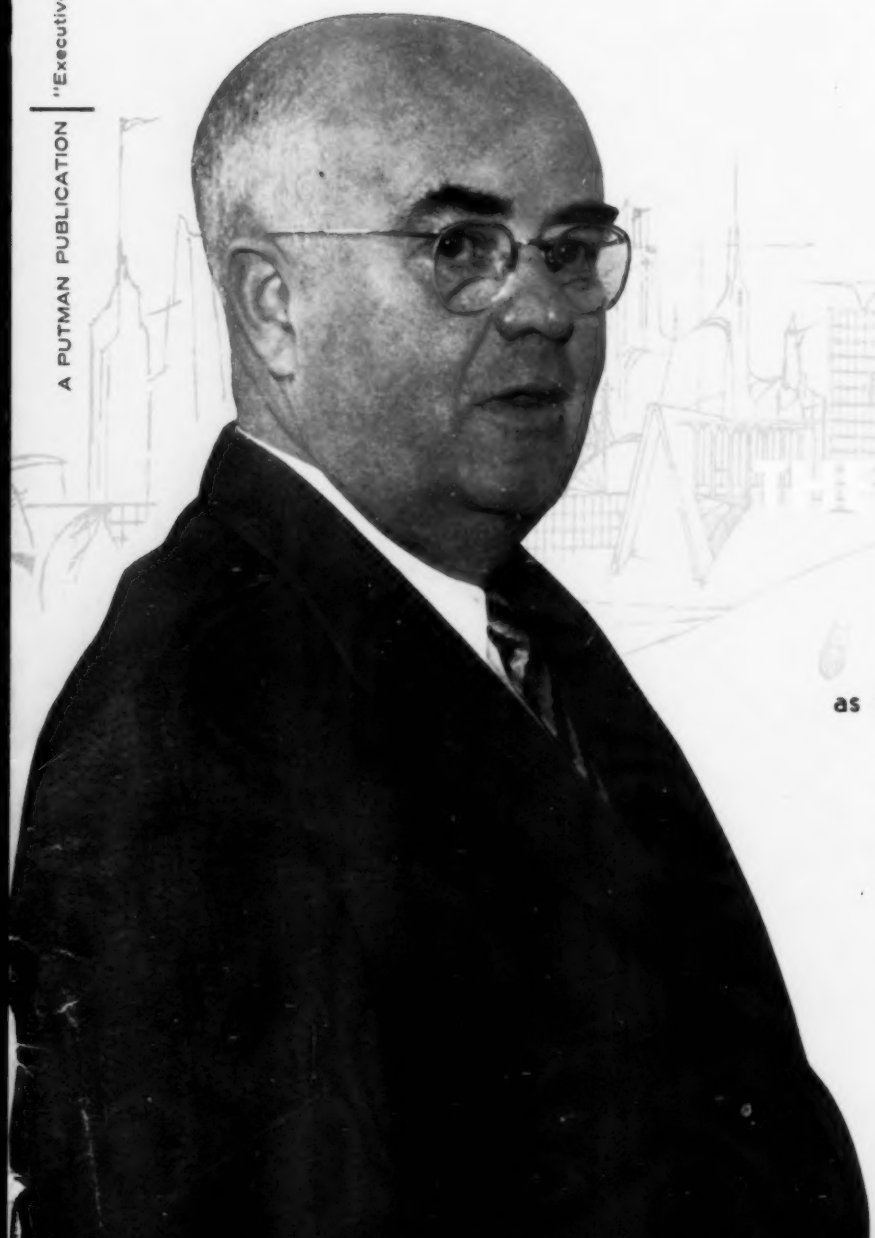
AUGUST 1958

In this issue: *28 reports of new engineering developments in plant and power services*

Department store carries one-third of air conditioning load by burning waste paper . . . 18

POWER INDUSTRY

PLANT SERVICES—POWER SERVICES FOR INDUSTRY



as visualized by MARMION S. OLDACRE

see page 12

University Microfilms
313 N First St
Ann Arbor Mich
Exchange list 1-50

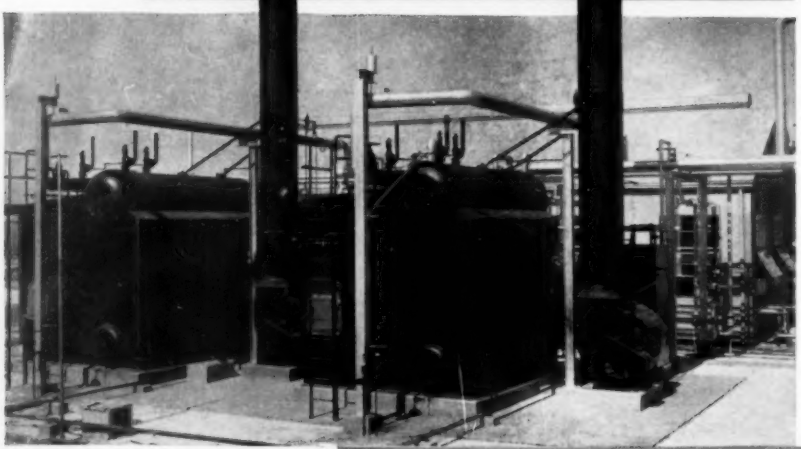
Over 60,000 copies circulated

$1.00 the copy

A PUTMAN PUBLICATION | "Executive Magazines for Industry"

Vogt

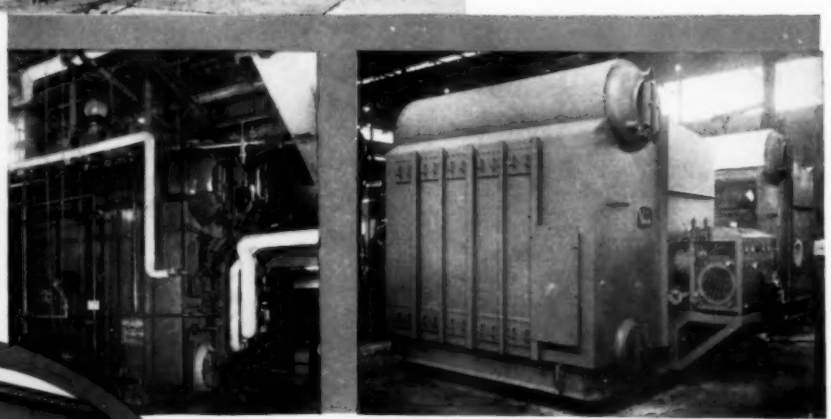
Package STEAM BOILERS *give* versatility with economy

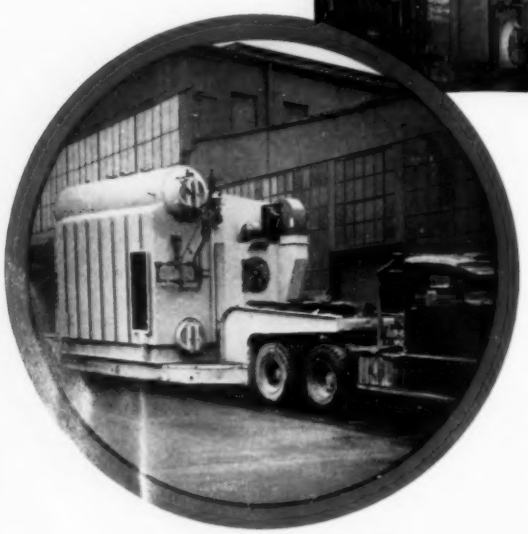


Above: Two units serve a gas pipeline company.

Left: Installation in fibre box-board plant.

Right: Unit for a leading soap manufacturer.





Enroute to an office building.

FOR POWER, PROCESS OR HEATING

Available in capacities from 10,000 to 50,000 pounds steam per hour in three standard pressures of 175, 250 and 375 pounds per square inch gage, factory assembled.

Write for Bulletin PSG-2, Dept. 24A-BIP

HENRY VOGT MACHINE COMPANY, Louisville, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati.

OTHER VOGT PRODUCTS:

DROP FORGED STEEL VALVES, FITTINGS, FLANGES AND UNIONS
PETROLEUM REFINERY AND CHEMICAL PLANT EQUIPMENT
HEAT EXCHANGERS • ICE MAKING & REFRIGERATING EQUIPMENT

Circle 2044 opposite last page

CONVENTIONS and EXHIBITS

Aug. 17-22: Illuminating Engineering Society Conference; Royal York Hotel, Toronto, Canada.

Aug. 18-20: AICE Second Annual Heat Transfer Conference; Edgewater Beach Hotel, Chicago, Ill.

Aug. 19-22: American Institute of Electrical Engineers (Pacific General Meeting); Sacramento, Calif.

Aug. 20-22: Seventh Hydraulics Conference sponsored by Hydraulics Division of ASCE; Atlanta Biltmore, Atlanta, Ga.

Sept. 4-5: International Conference on Air Pollution; Statler Hotel, New York, N. Y.

Sept. 7-10: Electrical Insulating Materials Association Conference; Carter Hotel, Cleveland, Ohio.

Sept. 7-11: World Power Conference; Queen Elizabeth Hotel, Montreal, Canada. Proceedings will be conducted in English and French.

Sept. 15-17: Process Industries Conference; Hotel Statler, Buffalo, N. Y.

Sept. 15-19: ISA Instrument-Automation Conf. & Exhibit; Convention Hall, Philadelphia, Pa.

Sept. 17-19: Northwest Electric Light & Power Association Annual Meeting; Sun Valley Lodge, Sun Valley, Idaho.

Sept. 21-24: Conference of the Petroleum Division of ASME; Cosmopolitan, Denver, Colo.

Sept. 21-28: American Institute of Chemical Engineers; Salt Lake City, Utah.

Sept. 22-25: American Mining Congress Convention & Exposition; Civic Auditorium, San Francisco, Calif.

Oct. 9-10: 21st Annual ASME-AIME Joint Solid Fuels Conference; Hotel Chamberlin, Old Point Comfort, Va.

Oct. 13-15: American Gas Association Annual Convention; Atlantic City, N. J.

Oct. 14-16: Joint Conference of ASME Lubrication Division & ASLE; Hotel Statler, Los Angeles, Calif.

POWER INDUSTRY

. . . with which is combined INDUSTRIAL POWER and INDUSTRY POWER . . . serves top executives and engineers who manage plant services and power services in selected plants and organizations.

The plant services include lighting, heating, ventilating, water supply and other conditions and material services needed for directed activity.

The power services include production, transmission and application of all forms of energy — steam, electric, mechanical, pneumatic, hydraulic, atomic — and the engineering and maintenance necessary for its continuance in:

- **MANUFACTURING AND INDUSTRY**
  - Chemical and process industries
  - Electrical and industrial machinery
  - Food and kindred products
  - Central utility stations and engineering headquarters
  - Textile manufacture
  - Gas companies and pipelines
  - Lumber and wood products
  - Waterworks
  - Metal industries
  - Stone, clay and glass products
  - Atomic energy
  - Transportation equipment
- **PUBLIC SERVICES AND INSTITUTIONS**
  - Hospitals
  - Office buildings
  - Hotels
  - Schools and colleges
  - Marine
- **CONSULTANTS**
  - Consulting engineers
  - Industrial architects
  - Contractors

Published monthly by

PUTMAN PUBLISHING COMPANY

PUTMAN PUBLISHING BUILDING
111 E. Delaware Place, Chicago 11, Illinois
WHitehall 4-6141

Also publishers of
CHEMICAL PROCESSING, FOOD PROCESSING, FOOD BUSINESS

ADMINISTRATION

Russell L. Putman	President & Publisher
Ewing W. Graham	Vice President & Treasurer
Richard H. Putman	Sales Manager
Roy G. Helsing	Production Manager
George W. N. Riddle	Director of Research & Development
Thomas J. Scanlon	Director of Circulation
Robert C. McKay	Circulation Manager

Advertising Representation is listed on page 34

SUBSCRIPTIONS

QUALIFIED READER SUBSCRIPTIONS are accepted without charge from selected executives and engineers who manage power services in plants and organizations. Subscriptions are accepted from "non-qualified" people—i.e., those whose job responsibilities are not within the orbit of management as described above—at $1.00 the copy; $10.00 the year in U.S.; $15.00 outside U.S. Note: Such subscriptions are available only as an accommodation and in response to specific request. They are not counted as "industry circulation" on BPA Audit Reports. Accepted as controlled circulation publication at Mendota, Ill., 1501 W. Washington Rd.

BPA BUSINESS PUBLICATIONS AUDIT of Circulation, Inc.

NBP NATIONAL BUSINESS PUBLICATIONS, INC.

August 1958

VOL. 74 No. 8

POWER INDUSTRY

PLANT SERVICES — POWER SERVICES FOR INDUSTRY

© 1958, Putman Publishing Co.

PUTMAN PUBLISHING COMPANY • 111 EAST DELAWARE PLACE • CHICAGO 11, ILLINOIS

IN THIS ISSUE

11 **Halts fouling in wooden cooling towers**

Editor Bruce Fader and chemical engineer E. S. Kennedy report on inhibiting algae growth with controlled pH.

12 **The power picture for 1983**

Energy consultant M. S. Oldacre foresees power demand exceeding twice our present capacity in the near future.

14 **They burn ammonia**

Atlas Powder's Joplin, Mo., plant burns ammonia to make nitric acid and uses the energy to run all its compressors.

16 **Shows way to safe liquid fuel storage**

18 **Air conditioning from waste paper?**

It's being done at Alexander's department store in White Plains, N.Y. Burning the trash furnishes the energy.

MONTHLY FEATURES

2 Conventions & Exhibits
4 Reports in Brief
9 Letters
20 New Developments
23 Engineering Data
28 New Literature
31 PhotoNews

EDITORIAL STAFF

editorial director & publisher
Russell L. Putman

editor
Bruce Fader

managing editor
George V. Michael

west coast editor
Karl Robe

advisory editor
John W. Bishop

advisory editor
Richard F. O'Mara

editorial assistant
Erin Tomchaff

Special Service for Readers

Want more information? Circle the key number of ad or editorial on the postpaid card in the back of this issue.

NOW···GLOBE OFFERS···
two new INTERCHANGEABLE trays for support of cables, wiring and tubing

★ Engineered for uniform design and easy installation
★ Steel or aluminum construction
★ Complete accessories for SPEEDIER Installation
★ No sharp edges to damage cables
★ Complete interchangeability

Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used INTERCHANGEABLY at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities— consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

109

PRODUCTS DIVISION

The **GLOBE** *Company* MANUFACTURERS SINCE 1914

4036 SOUTH PRINCETON AVENUE, CHICAGO 9, ILLINOIS

Circle 2045 opposite last page

REPORTS IN BRIEF

Electric power construction continuing at record pace, EEI survey shows

Total electric power capacity addition for 1958 will be about double that put in operation last year, and is expected to exceed previous (1955) record by some 3 million kilowatts, according to the 23rd Semi-Annual Electric Power Survey of Edison Electric Institute.

The survey found that construction of new facilities by electric power systems in the US will add about 15¾ million kilowatts to the total power-producing capability. This will bring the total to around 147 million by the end of the year.

In forecasting peak loads for 1958 through 1960, the Survey shows the December, 1958, peak will reach an expected 120 million kilowatts — nearly 12 percent above last winter's peak.

Gross margin of generating capability over demand will be 23 percent for this winter and will remain about the same through 1959 and 1960.

In the long run, demand for electric power by 1975 will be double that of 1950. Energy consultant M. S. Oldacre paints the 1983 power picture on page 12 of this issue.

National bushing standard has been worked out

Details have been worked out and agreement obtained on a national bushing standard covering the most prevalent voltages used on power circuit breakers and outdoor transformers. The new American Standard has been designated C76. la-1958, Outdoor Apparatus Bushings.

Nuclear power report

Here's the latest from the nuclear power field:

Alaska is getting its first atomic power plant. ALCO Products, Inc. has received an order to furnish entire nuclear system for the USA Corps of Engineers at Fort Greely, near Fairbanks.

The system using an Army Package Power Reactor will equally divide its thermal output between electricity generation and space heating.

In a civilian power project, SRE (Sodium Reactor Experiment), the design power level of 20,000 kw has been reached.

The Southern California Edison Company is purchasing the heat and converting it to electricity at its generating plant adjacent to the reactor.

Experience gained from the SRE will be used in developmental work for a 75,000 kw station in Nebraska.

The British think they will win the battle for cheaper nuclear power. Target date is mid-1960's. British scientists are confident that by that time nuclear power stations will be producing electricity cheaper than by conventional coal-fired stations.

Want some uranium? The AEC now allows domestic producers of uranium ores and concentrates to make private sales of these materials (as long as they are to be used for peaceful purposes).

Fresh water from salt — with electricity to boot

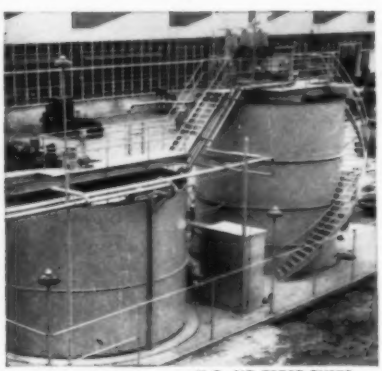
Combination of salt water distillation with production of marketable surplus electricity marks a major step forward in producing inexpensive potable water from the sea.

In the world's largest single installation, built by Singmaster & Breyer for Island Territory of Aruba, Netherlands Antilles, exhaust steam from conventional power plant is used in distillation process. Estimated production costs will be $1.75 per 1000 gal.

ILLCO-WAY
ionXchange

soften
de-alkalize
clarify
WATER

REMOVE
organic matter
turbidity
color
iron



U. S. AIR FORCE PHOTO

HIGH-FLOW, UP-FLOW
CLARIFIER

The Clarifier shown above is part of an ILLCO-WAY ionXchange installation, at a metal-finishing plant, which is used for waste disposal and water recovery. Similar Clarifiers are widely employed to clear up surface waters used by various industries — removing organic matter, hardness, alkalinity, turbidity, color, and iron, as required by specific conditions.

USED AS PRE-TREATMENT

In many instances it is more economical to use a Clarifier in the initial part of a system. Certain water supplies contain organic matter or turbidity which can be removed most efficiently by flocculation, or contain carbonate hardness or alkalinity which can be largely reduced by precipitation — in which situations, a Clarifier is indicated as best. *Let us analyze the water you propose to use, and advise you.*

ILLCO-WAY
ILLINOIS WATER TREATMENT CO.
840 Cedar St.
Rockford, Ill.

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

Circle 2046 opposite last page

May use A-blast to build Alaska harbor

Sometime this summer, University of California scientists wil begin investigations into the possibility of using nuclear explosives to excavate a harbor in northwest Alaska.

Last year's underground blast has given impetus to the idea. That blast produced at least 200,000 tons of permeable broken rocks with radio-activity being contained underground.

And not so peaceful . . .

. . . is the surmise of Prof. Jay Orear of Columbia University.

In his testimony to the Senate Disarmament Committee, he states that "it is a simple technical problem to smuggle megaton bombs into the United States, and to plant them around various cities."

He predicts that within a few years every major American city will contain hidden H-bombs. "If I, and I am using quotation marks about the 'I,' were in charge of Soviet espionage, the bombs would already be here," he concluded.

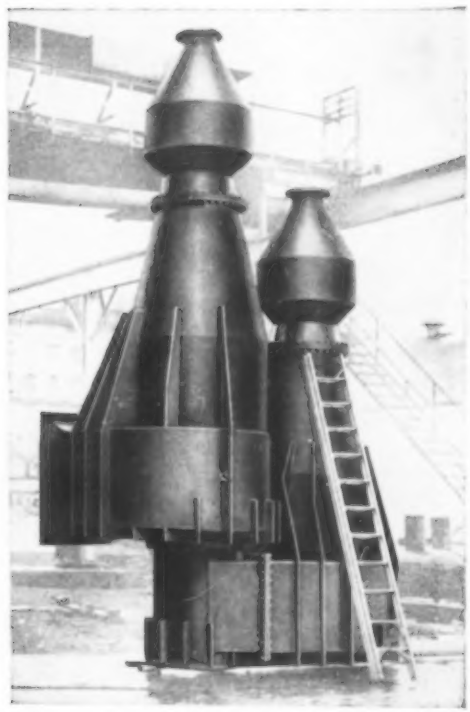
Gas lubrication to solve high-temp problems

Machinery lubricated by air or other gases may overcome some of the problems surrounding use of conventional lubricants.

Papers presented at ASME's Detroit meeting discussed techniques dealing with gas-lubricated bearings. Lubrication may be achieved either by injecting high-pressure air around a bearing or by "normal hydrodynamic action."

Experiments have been conducted with normal air and various gases including neon and helium.

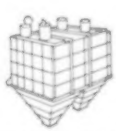
Uses for gas-lubricated bearings would include high temperature devices for which no "normal" lubricant has yet been developed, radioactive atmospheres (where conventional lubricants tend to break down), and in machines sensitive to contamination from lubricating oil.



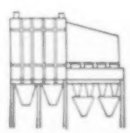
Exploring new frontiers!

But these aren't satellite launchers, though they're specially designed for high temperature operation: they're Buell extra-efficient cyclone dust collectors . . . and the new frontiers they're exploring are in industry. Everywhere in American industry, from cement mills to refineries, from chemical plants to power generating stations, Buell collectors set new records in percentage of dust removed, low maintenance, and improved plant operation. Even in the age-old field of fly ash collection, Buell extra efficiency pays off. Only *Buell* cyclones have the unique Shave-off port that traps small fines in the double eddy currents. And Buell large-diameter design eliminates bridging, clogging, or plugging. *All three* Buell Systems are illustrated and described in "The Collection and Recovery of Industrial Dusts". Write for a copy to Dept 90-H, Buell Engineering Company, Inc., 123 William St., New York 38, N. Y.

BUELL CYCLONES



"SF" ELECTRIC PRECIPITATORS



PRECIPITATOR-CYCLONE COMBINATIONS

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

Circle 2047 opposite last page

Utility injury rate down

NSC reports 7% decrease in 1957

Although 1957 saw fewer injuries than 1956, the injuries sustained were more severe.

The National Safety Council's report on member companies shows average frequency rate in 1957 was 6.27. This was a two percent reduction from 1956.

The average injury severity rate went up one percent.

In both instances, electric utilities made a better showing. There was a seven percent decrease in frequency rate although the rate is still a little higher than the average. The severity rate dropped less than half of a percent.

American papers at CIGRE

US experts in field of electrical power presented eight of the 130 technical papers at the 17th biennial convention of CIGRE (French abbreviation for International Conference on Large Electric Systems).

Held in Paris June 4 to 14, the convention heard U S reports on: transmission lines operating at 345,000 volts at high altitudes, high-speed power circuit breakers, use of digital computers to solve power problems, and discussion of problems in large high-voltage transformers.

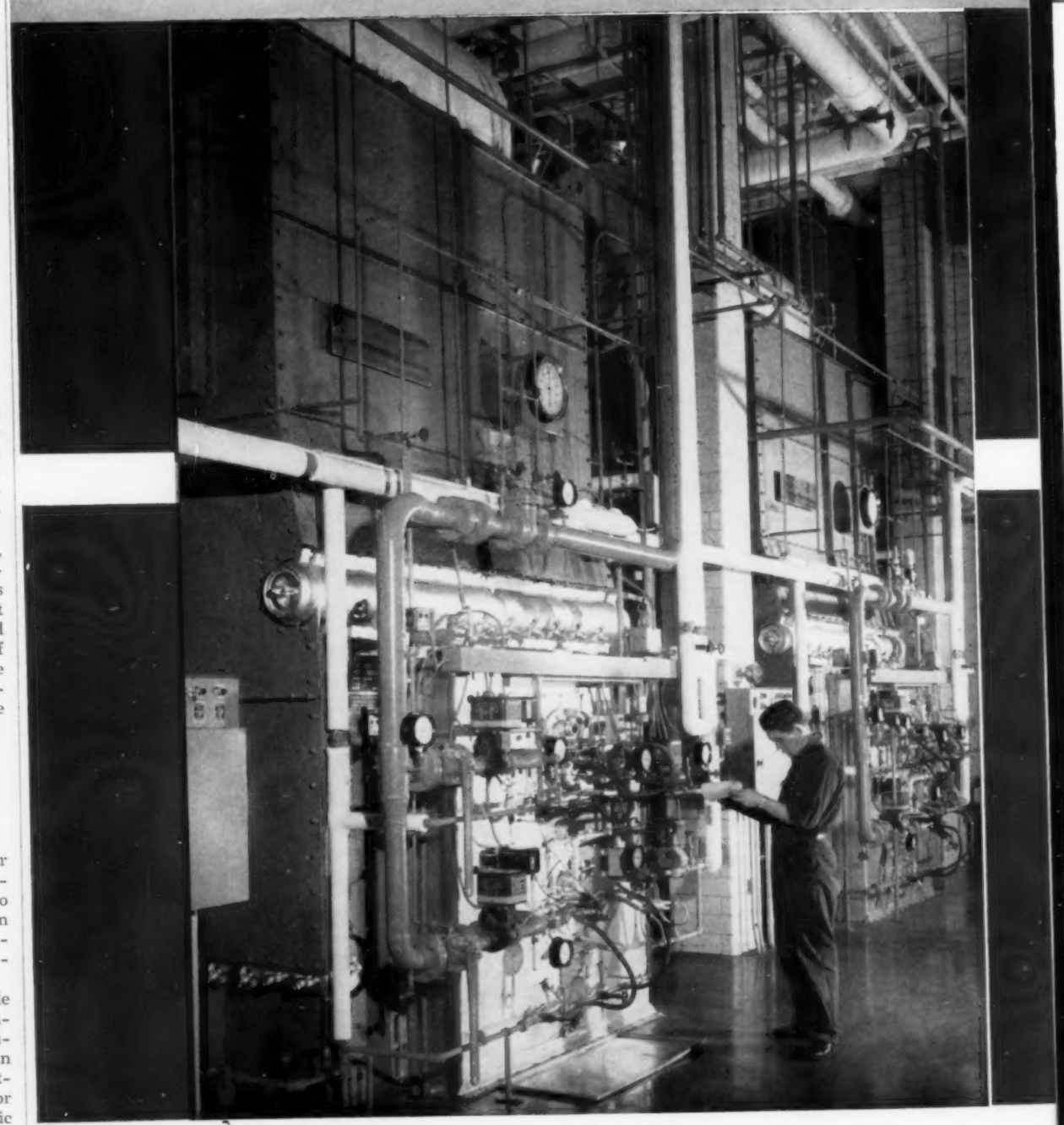
Extra-high-voltage line placed in service

The nation's largest line for interchange of a bulk electricity supply between two power companies has been placed in service between Orland Park, Ill., and New Carlisle, Ind.

The 345,000-volt, 90-mile tower line will serve customers of both the Commonwealth Edison and American Electric Power Company. Latter is new corporate name for American Gas and Electric Company.

WICKES TYPE S-1AL

HEAT ONE OF AMERICA'S



STEAM GENERATORS
MOST MODERN BUILDINGS

CONNECTICUT GENERAL LIFE INSURANCE CO., Bloomfield, Conn.

ARCHITECTS: Skidmore, Owings & Merrill

GENERAL CONTRACTOR: Turner Construction Co.

MECHANICAL CONTRACTOR: Kerby Saunders, Inc.

A recent exhibit at the National Gallery features 10 of America's most modern buildings. The American Institute of Architects, on the occasion of its Centennial, included in the exhibit the new home office of the Connecticut General Life Insurance Company in suburban Hartford, which is equipped with Wickes boilers. This spacious, sun-flooded building of steel and glass, is nearly a modern city in itself, for it houses not only the complete office system, but includes employee lounges, game rooms, medical department, mailrooms, auditorium, bowling alleys, barber and beauty shops as well.

For the heating system in this mammoth structure, engineers chose to install two Wickes type S-1AL steam generators equipped with both oil and gas burners. In addition to general heating, the steam generators provide power to operate the refrigeration machines and a snow-melting system on the truck ramp. The boilers each have 3700 sq. ft. of heating surface, and were designed for a maximum continuous load of 27,500 pounds of steam per hour at 200 PSIG.

Bulletin No. 55-1 gives complete facts on Wickes products. New engineering bulletins on Type-S and Type-A Steam Generators are also available on request.

WICKES

WICKES BOILER CO.

DIVISION OF THE WICKES CORPORATION, SAGINAW, MICHIGAN

RECOGNIZED QUALITY SINCE 1854 • **SALES OFFICES:** Boston • Chicago • Cleveland • Dallas • Denver • Detroit • Houston Indianapolis • Los Angeles • Memphis • Milwaukee • New York City • New Orleans • Portland, Ore. • Saginaw San Francisco • Springfield, Ill. • Tulsa

168

Circle 2048 opposite last page

Network analyzer solves power flow problems

A computerlike network analyzer that can simulate the power system of an entire small town or public utility has been acquired by Packard Laboratory at Lehigh University.

The analyzer's first assignment was the study of a power flow problem from planning engineers of the Pennsylvania Power and Light Co.

In predicting voltage adequacy for various line conditions, the unit, built by the I-T-E Circuit Breaker Co., showed that the utility will not have to build a new line to handle anticipated demands.

Produces usable coke from steam generation

Continuous process in conjunction with steam generation produces stoker coke which is being shipped to a chemical plant for use in producing calcium carbide.

Process was developed by Island Creek Coal Company from processes now in commercial use in Canada and South Africa.

Orders highest-head reaction turbines

Two Francis-type hydraulic turbines to handle maximum static head-difference of 1110 ft have been ordered for the Mammoth Pool hydroelectric project. The vertical-shaft turbines, with shop-welded plate steel spiral cases, will be supplied by S. Morgan Smith Co.

Develops high capacity circuit breaker

What is to be industry's first 230 kv oil circuit breakers with interrupting capacities of 20,000 mva have been delivered to Niagara Mohawk Power Corp. Units were developed by General Electric Company.

...take another look...

Had you noticed? . . . .

. . . the design of this magazine is "different" —

— its "wide screen" pages give more effective presentation to editorial . . . and advertising.

— it permits editorial to be carried throughout the issue.

— it's easy to carry, to handle, to file.

This "executive size" . . .

invites fast, easy reading of busy executives — its columns are newspaper width . . . there's high visibility everywhere.

All Putman Publishing magazines now appear in this format . . . CHEMICAL PROCESSING, FOOD PROCESSING, FOOD BUSINESS, POWER INDUSTRY . . .

. . . here's another step forward in business paper publishing.

POWER INDUSTRY

Russell L. Putman

Publisher

Gas turbines for autos

Automotive gas turbines may completely replace conventional gasoline and diesel engines within the next 50 years was prediction made in a paper presented at ASME meeting in Detroit.

The authors, two English engineers, base their statement on recent progress "not only in the design of automotive gas turbines but in the development of special materials and manufacturing methods suitable for their production."

Advantages given: turbine engines are simpler, give more miles to gallon of fuel, and use less-expensive fuels.

Problem to date has been cutting turbines down to size without losing efficiency.

Thermodynamic data program in progress

The National Bureau of Standards is collecting and compiling data on the chemical thermodynamic properties of a multitude of materials.

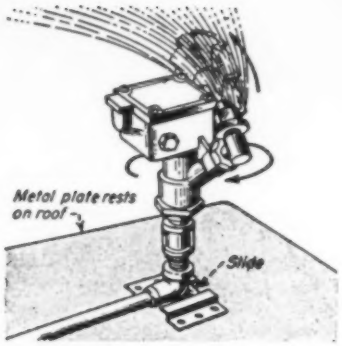
Object of the program is to present in convenient tabular form a critical summary of the thermodynamic information available on each chemical substance.

After data are assembled, analyzed and selected as to "best" values, they are tabulated and distributed without charge.

Outdoor latex paint under test

Outdoor water-based latex paint is being tested across US by its developer, Union Carbide, to determine its resistance to varying climatic conditions. Paint, WC-130, can be sprayed, brushed, or rolled on.

Results so far indicate good performance on brick, cement block, stucco, concrete, and cement-asbestos shingles. Bakelite expects it to wear much longer than the standard three years for conventional paint jobs.



COOL any building from the ROOF

Everyone knows how the sun, beating down on the roof of a building, descends into the interior. It makes the occupants uncomfortable and ruins merchandise.
Roof cooling is the answer. It can be used on any roof to keep the building cool or to save air conditioning costs. Best equipment for the job is Ruppright's Rotary Roof Cooler. Easily installed, it produces a thin film of water on the roof. This film evaporates but is continuously renewed by the slowly-rotating cooler making the roof cooler than the air.

INSTALLED WITHIN A FEW HOURS

RUPPRIGHT'S ROTARY ROOF COOLER

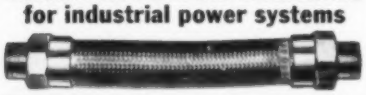
P.O. Box 43555 pi, Los Angeles 43, Calif.

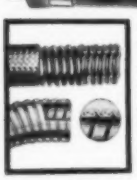
Circle 2049 opposite last page

COBRA® FLEXIBLE

SEAMLESS METAL HOSE

Custom constructed assemblies for industrial power systems





All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

write — wire — phone: RE 7-3311
...for prices and catalogs

COBRA METAL HOSE

5059 S. Kedzie Ave. • Chicago 32, Ill.

Circle 2050 opposite last page

LETTERS

Your views are welcome in this column. Address "Letters, Power Industry, 111 East Delaware Place, Chicago 11, Ill." Letters should be brief and confined to the editorial of this magazine or other topics of interest to the power services field.

How much is worth saving?

We have read with interest the article entitled "Correct Voltage Affects Operating Costs" by Mr. C. T. Baker, which was published in the April, 1958 issue of POWER INDUSTRY. Although the statements regarding overvoltage are, for practical purposes, in agreement with our concept, we are confused with the relation between problem and solution.

It seems that the problem was one of considerably increased operating costs per unit in this large ice making and cold storage plant after the voltage was raised to a relatively high level and that this trouble was solved by reducing the voltage back to a more normal operating level.

Although information was not published on the entire 600 hp of connected load, we analyzed the seven listed motors accounting for 481 hp assuming that the motors operated at 100 per cent load and 24 hours per day.

This would seem to be a reasonable assumption for an ice plant and in order to make the most drastic difference in our comparison, it was assumed first that motors operated at 550 v all the time and then that they operated at 625 v all the time. (It is noted in the text that actually the high voltage occurred primarily from 5:00 p.m. to 7:00 a.m.)

. . . In view of the fact that high voltage seems to have accounted for $16.99 out of a total of $3,411.02 per month, we do not understand how a change in voltage could warrant this statement "—power costs per unit of output increased considerably".

We would be interested in learning where we have misconstrued the points in this interesting article.

E. E. UMLANG, Supervisor
Test & Statistical Division

• *First of all, I failed to state in my story that the voltage delivered to the motors referred to was never less than 600 volts. During the hours from 5 p.m. to 7 a.m. the voltage jumps to 625.*

• *Second, I do not believe anyone can honestly question the fact that when a power user is compelled to operate a 250 hp motor for 12 hours out of each 24 hours at an efficiency of one percent below its efficiency at design voltage and a 175 hp motor at an average of 91.5% efficiency rather than 92.5% efficiency, citing the two larger units only, it would appear that the power user is entitled to be supplied with current at the voltage for which the motors are cited.*

By your own calculations, you show a loss to the user of $17.00 per month. This figure represents an increase of $102.00 for six months. If you allow 50% of this for the second six months of the year, the extra cost amounts to $153.00 per year.

How come that "ain't worth saving?"

C. T. BAKER
Consulting Engineer

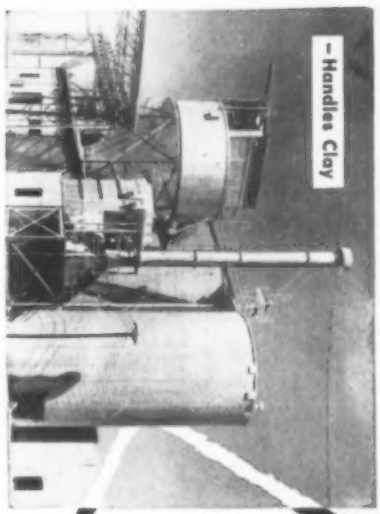
S O S — wrong size

We enjoyed reading your excellent "Packaged Boiler Sold Off Shelf" which appeared on page 11 of your June, 1958 issue.

. . . However, you described Cleaver-Brooks boilers as being built in sizes up to 350 hp. Cleaver-Brooks builds boilers in sizes 15-600 hp, 15-250 psi for heating and process applications. Your story described only **one model—the model CB**—which is now built in sizes up to 350 hp.

K. K. HILGENDORF
Advertising Manager
Cleaver-Brooks Company

• POWER INDUSTRY'S "SOS" *article erred as reader Hilgendorf points out. The emergency performance of installing a new boiler in four days flat is still impressive, regardless of size.* —*The Editors*



Before we built this bin we had to know...

1. **The characteristics of the material.**
2. **The method of loading.**
3. **The method of discharge.**

Over a long period of years, we here at Neff and Fry have learned that a *strong bin* is only part of the storage problem.

While we do not sell machinery, nor are we affiliated with any machinery manufacturers, we can be of great help to you in suggesting loading and unloading systems.

On your next storage bin, call us in on the early stages of planning. You will have a better bin.

NEFF & FRY • 310 Elm Street, Camden, Ohio

N & F

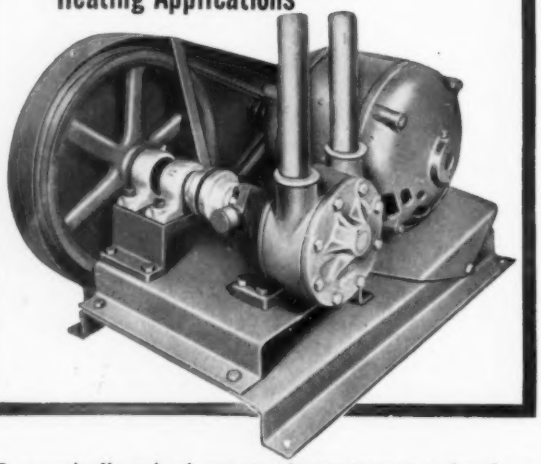
The difference is in the shape of the STAVE!

Circle 2051 opposite last page

new

TUTHILL
SU
PUMP UNIT

- For Handling Heavy Fuel Oils
- In Packaged Boiler and Commercial Heating Applications

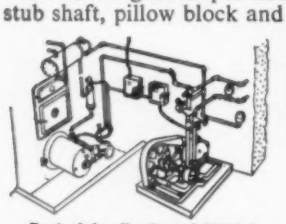


Economically priced, TUTHILL'S SU PUMP UNIT has been specifically developed for handling heavy fuel oils in commercial heating applications and with packaged boilers.

This "v" Belt Driven Unit is compact—complete units measure only 24¼" x 14⅝". Quiet operation is insured by the 2 or 4 "v" Belt Drive and the integral gear positive displacement pump design.

Construction features which provide dependable trouble-free operation, lower maintenance costs, include two ball bearing pillow blocks, one point take-up for simple adjustment of belt tension, removable belt guard and new fabricated steel base with versatile motor mounting.

SU PUMP UNITS can be furnished with a wide variety of pumps and motors for pressures up to 300 psi, capacities to 2030 gallons per hour. Sub-assemblies of pump, stub shaft, pillow block and sub-base are also furnished separately as a unit for incorporation into systems by boiler and furnace manufacturers. Write today for complete information.



Typical Application of SU Unit

TUTHILL PUMP COMPANY
95 East 95th Street, Chicago 19, Illinois
Gentlemen:
Please forward Catalog describing Tuthill SU Pump Units.
NAME_____ COMPANY_____
TITLE_____
STREET_____
CITY_____ STATE_____

TUTHILL PUMP COMPANY
951 East 95th Street, Chicago 19, Ill. | PUMPS FOR YOUR PURPOSE

Circle 2052 opposite last page

LETTERS

Clean sweep

In a recent issue of your magazine there is reported an article entitled "Combat Conveyor Carryover", which we believe sets forth new data on the efficacy of revolving brushes placed under belt conveyor head pulleys.

Will it be possible to obtain a copy of that issue, or a reprint of that particular article?

BENJAMIN A. SMITH
Vice President of Engineering
The C. O. Bartlett & Snow Company

• *Reader Smith has been sent a clipping. A limited number of single copies are available to others interested.*
—The Editors

Yes, indeed!

I am interested to know whether or not your series entitled "Fluid Mechanics" is going to be published in form similar to other Power Basic Series.

If this series is to be published I would like very much to have them.

H. J. MOREAU
Electrical Engineer

• *Indeed the series has been published. It is available. Send $1.50 in check or money order to:*

Fluid Mechanics Reprint
Power Industry
111 E. Delaware Place
Chicago 11, Ill.

"He don't take kindly to helpful suggestions."

Would you like to receive POWER INDUSTRY regularly?

If you are not already receiving POWER INDUSTRY personally, fill in the information called for below. If you qualify as an executive or engineer who manages power services, you will be added to our circulation list without payment of any formal subscription price.

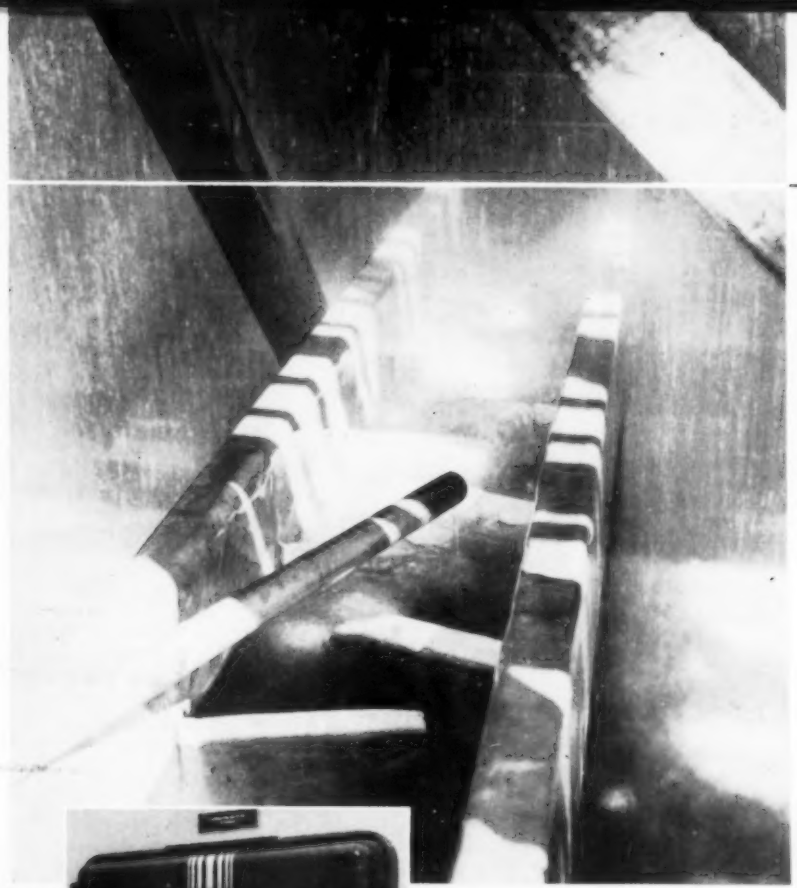
To qualify for POWER INDUSTRY'S regular circulation list, you must have executive or engineering responsibility for installation, operation, and/or engineering maintenance of power services in your company. (Circulation is extended to consulting engineers responsible for power services.)

Mail form to: Circulation Department
POWER INDUSTRY
111 E. Delaware Place
Chicago 11, Illinois.

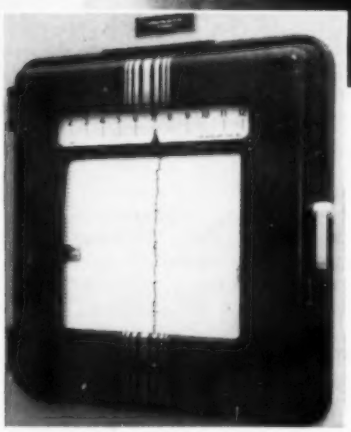
Reader Qualification Form

Name .....
Title .....
Company .....
Street Address .....
City ..... **Zone** .... **State** .....
Describe job function and responsibilities:
.....
.....
Number of persons employed in plant .....
Check off all categories that apply to you:
.....**Manufacturing plant**
.....**Utility**
.....**Service industry or institution**
.....**Consulting or construction engineers**
.....**Engineering headquarters of multiplant firm**
.....**Government installation**
.....**Other** .....
Equipment ratings:
Boilers: Number .... **Total Capacity:** ..... **lb/hr**
Total connected electric load .....**kva**
Total transformer capacity .....**kva**
Total number electric motors .... **Total hp** ....
Total number pumps ..... **Total hp** .....
Total number compressors ..... **Total hp** ....
Products manufactured .....
Signed .....
Date .....

AUGUST 1958
VOL. 29 NO. 8
POWER INDUSTRY



Looking down the trough (inside cooling tower), showing heavy rain of water being cooled. Acid is added through lead pipe (left foreground) and mixed as dilution water passes baffles



Trace on strip chart shows how accurately pH is held

Controlled pH halts fouling, corrosion

Electric power station solved a nasty water conditioning problem with automatic addition of sulfuric acid

By **BRUCE FADER**, Editor
With **EARL S. KENNEDY**, Chemical Engineer
Kansas Gas & Electric Company

PROBLEM: In 1950, report of an inspection team alerted the Ripley Station of Kansas Gas & Electric to possible trouble. Slight fungus attack of wooden cooling towers had been noted.

Among the recommendations of this team was a suggestion that pH of recirculating water be lowered from 8.0-8.3 to 6.5-7.5. This is the natural pH of the redwood of which towers are built.

While better for life of redwood, however, this lower pH could have put metal equipment in jeopardy.

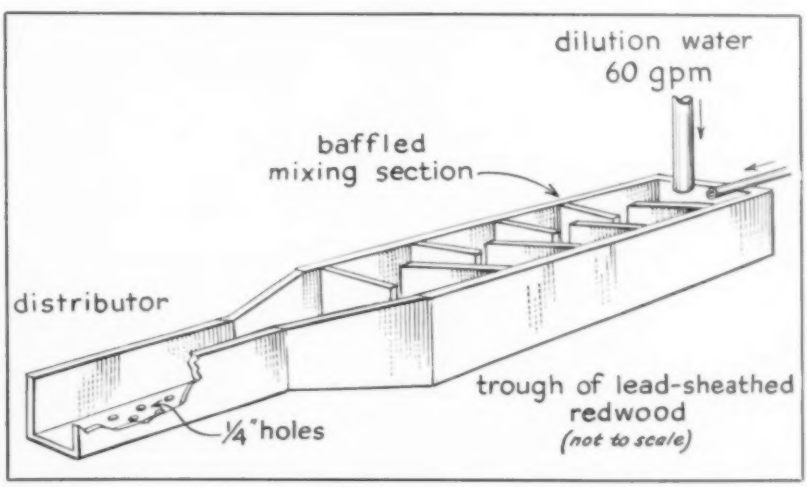
Before anything was done about lowering pH, a second situation added urgency to the problem. Heat transfer figures started downwards and inspection disclosed spongy, voluminous slime on the water side of condensers. Manual cleaning and heavy chlorination checked but did not clear up this fouling.

Trouble was spotted as an influx of biological manganese in local water table. Chlorination produced granular deposits of manganese dioxide at the chlorine orifice, tightly plugging it. One condenser had to be acid washed. It was imperative that pH be lowered to the 7.0-7.5 region and heavy doses of polyphosphate be added to sequester manganese and to inhibit corrosion of metal.

Solution: Acid addition system installed used a 12,000-gallon normalized steel tank for storage of 66° Bé sulfuric. Acid is siphoned from this tank to a five-gallon suction tank just above acid pumps; siphoning being started by a jet pump which can be valved off.

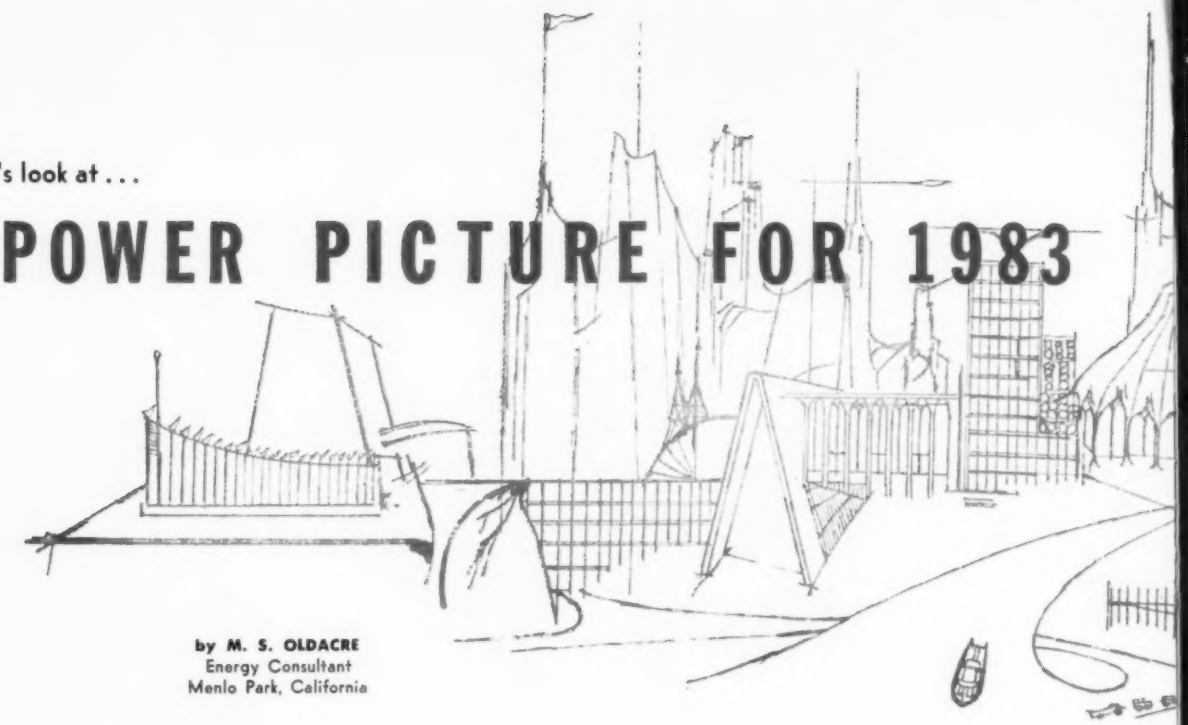
Proportioning pumps move acid through stainless pipe to the tower. Pipe is run up side of tower and terminates in a loop with an inverted gooseneck tapped in at its highest point. This assures enough head (back pressure) to produce good seating of the ball seals of the proportioning pump, yet prevents siphoning through the pump. Inside the tower a lead pipe descender carries acid to one end of an open distribution trough. Vis-

(*Continued on bottom page 33*)



Let's look at . . .

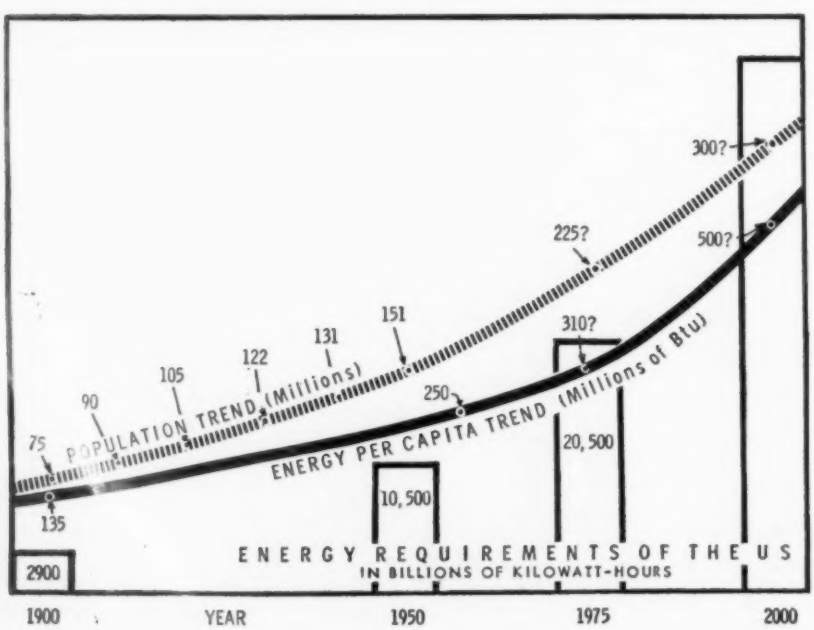
THE POWER PICTURE FOR 1983



by M. S. OLDACRE
Energy Consultant
Menlo Park, California

Pushing time ahead by 25 years, the following energy supply pattern emerges:

- Oil and gas will be used in increasing amounts but most likely at a decreasing percentage of the total supply.
- Shale oil will become an economically competitive source with petroleum and will supply a portion of the requirements for liquid fuels and related products.
- Water power will increase in absolute amount but will become a smaller portion of the total energy supply.
- Coal and lignite will become a much greater factor in the total energy supply.
- Nuclear energy may supply a small portion of the total energy needs, maybe 2 per cent or less, or possibly 5 to 10 per cent of the electric energy developed in the country. Seven and one-half per cent might be a good figure for 1975 and 10 per cent for 1980.



Actually, the energy supply problem in this country for a considerable period of time will be determined by economics and not by prospective shortages alone. If the domestic sources can be developed and held in reserve as necessary, they will serve as a brake on the price of foreign sources.

These can be utilized as long as available at competitive prices.

At the present time, it seems that research and development of means to fully use the coal and lignite is an essential activity, so that our industries will not be dependent on foreign oil except at reasonable prices.

A starting point for estimating future energy demands is the population growth of this country. It far exceeds the estimates of 10 to 15 years ago.

Instead of leveling off at about 160 million people by 1960, it is now estimated that there may be more than 225 million people by 1975 and nearly 300 million by 2000.

The next point to consider is that a major factor in the economic growth of this country has been the enormous use of energy per capita compared to other parts of the world. Since 1900, there has been an increase from about 135 million to about 250 million Btu per capita — and there is every reason to believe that there are further increases ahead.

The total energy demand projected from these two factors is only partially off-set by the continued increase in efficiency of utilization of heat energy. The result is that total demand for energy has nearly quadrupled in the past 50 years.

Present estimates suggest that the energy requirements in 1975 will double the 1950 figures, an increase from about 36 quadrillion Btu to around 70 quadrillion Btu (10,500 to 20,500 billion kw-hr). By 2000 possibly 150 quadrillion Btu (44,000 billion kw-hr) will be needed.

Demand: fantastic

These requirements seem fantastically high. But they should be considered as conservative, as they are about the minimum of the projections made by observers who have carefully studied the problem.

The estimates were scaled down from a simple projection

M. S. Oldacre, until recently a senior staff consultant on electrical engineering and energy research at Stanford Research Institute, played a leading role in the developmental studies of energy in the Institute's Economics Division with most of his attention on problems of the electric utility industry.

He began his career as a testing engineer for Commonwealth Edison. After the First World War he joined Westinghouse Electric and Manufacturing Company at East Pittsburgh in the Stoker Department. He later became an engineer specialist for the company.

Mr. Oldacre returned to Commonwealth Edison's Engineering Department and was named Director of Research in 1946. He assumed supervision of the many research projects sponsored by the company and placed in several midwestern universities (he has a degree from Purdue, studied also at Northwestern). He joined Stanford Research Institute in 1954.

For many years he has been a Fellow and life member of the American Institute of Electrical Engineers.

of past data by assuming that the rate of population growth will decrease from the present rate of about 17.3 persons per 1000 to 8.9 in 2000 AD.

Also, it is assumed that the per capita demand for output energy will increase only 2 per cent per year, while for the past 50 years, it has averaged 3.4 per cent.

Careful estimates by many of the best informed geologists, geophysicists, and other scientists place the peak of production of both petroleum and natural gas in this country at somewhere within the next 10 to 15 years.

This does not mean that exhaustion of these energy sources will occur immediately thereafter, but it does indicate that other sources of energy must be drawn upon to a greater extent.

The dire predictions of shortages have been unduly pessimistic, since year after year newly discovered reserves have been greater than the production during the year. Thus, the total reserves have continued to increase.

However, because of increasing difficulties in finding new oil and gas fields, it is unlikely that a high rate of additional discoveries will continue indefinitely.

Unfortunately, water power plays a relatively minor role in the total energy supply of the country. Although there is a large amount of potential water power, much of it cannot be economically developed under present or foreseeable future conditions.

The result will be that water power will continue to decrease in importance as a supplier of energy.

Although some scientists have indicated that solar energy will rapidly become a factor in the overall energy supply of the world, developments have not materialized to permit such use on a significant commercial scale.

Some scientists in power-hungry countries believe that nuclear energy will produce the needed power, and so projects have been approved for the design and immediate installation of major power stations in these countries.

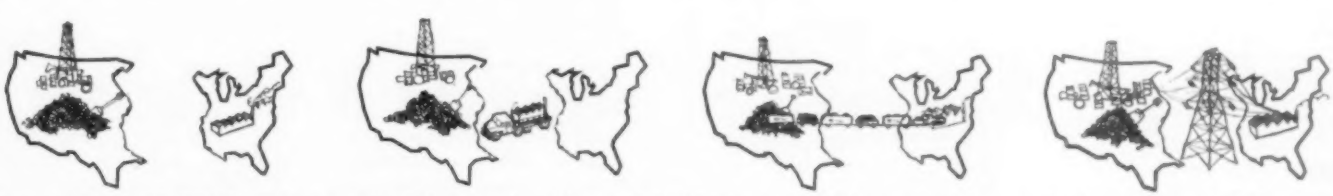
Atom — tortoise or hare?

Their expectation is that no matter what the cost of power from these nuclear plants, it will be no higher than that from conventional sources during the life of the plants. In addition, and most important, power will be available when required.

In this country, under economic conditions different from those of most other countries, experimental and developmental work can continue at a more orderly pace, to design nuclear and perhaps solar energy power plants that will deliver power at costs equal to or lower than costs of power from conventional sources.

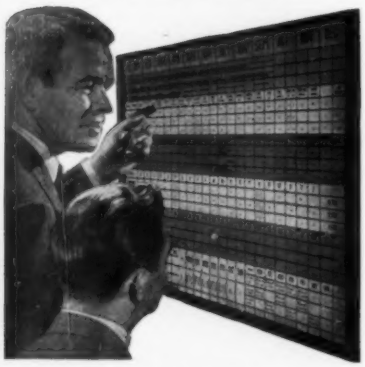
It is essential, of course, to establish clearly the magnitude of the energy problem — it is of staggering proportions whether in terms of the amount of energy involved,

(*Continued on page* 19)



FUEL DILEMMA TO COME will pivot on most fuel reserves located west of the Mississippi, most fuel use east of it . . . will industry move to its fuel source? . . . and if not, do we ship fuel or power?

How To Get Things Done Better and Faster



BOARDMASTER VISUAL CONTROL

★ Gives Graphic Picture—Saves Time, Saves Money, Prevents Errors
★ Simple to operate—Type or Write on Cards, Snap in Grooves
★ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
★ Made of Metal. Compact and Attractive. Over 250,000 in Use

Full price $49.50 with cards

FREE 24-PAGE BOOKLET NO. P-50 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS

55 West 42nd Street • New York 36, N. Y.

Circle 2053 opposite last page

CHEAP ASSURANCE *against* SEAM FAILURE

It costs up to hundreds of dollars for a calking or patching job after the girth seam of a riveted HRT boiler has deteriorated. The price of a National Seam Protector for a 72-in. boiler is only $72.

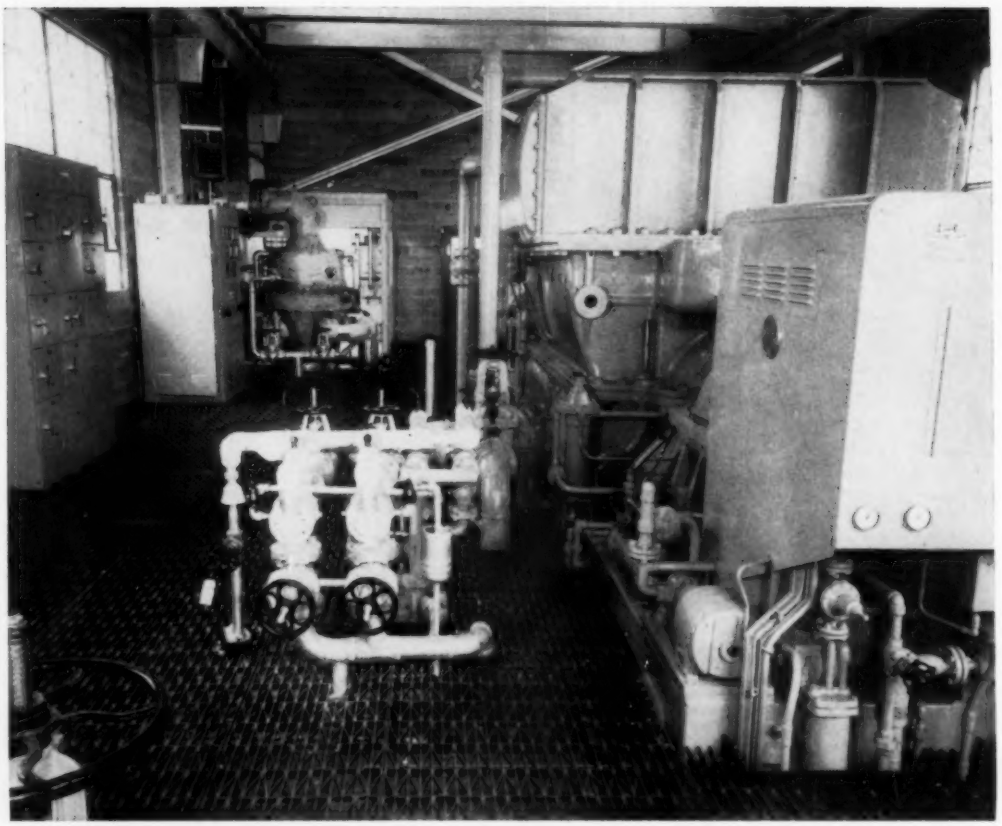
Obviously, it is much more economical to protect the seam than repair it. What's more, a weakened seam might let go and cause expensive damage.

The girth seam of a riveted HRT boiler is vulnerable from the very nature of the case. Our literature tells why; also explains how the ceramic National Seam Protector is installed to insulate the seam. You're welcome to our literature, particularly if you operate one or more riveted HRT boilers.

NATIONAL BOILER PROTECTOR CO.

928 REIBOLD BLDG. • DAYTON 2, OHIO

Circle 2054 opposite last page



Atlas Powder's nitric acid plant uses ammonia combustion to furnish energy to all of its compressors . . .

They burn ammonia

A 250 ton/day, pressure nitric acid plant which is completely self-sustaining was recently placed on stream by Atlas Powder Company at Joplin, Missouri.

The plant is designed so that, once it is started up, the energy released from the burning of ammonia is recoverable to such an extent that no outside energy is needed for air compression. (A minor amount of electricity is required to operate pumps, etc.)

Although nitric acid plants have been built in the past in which half or two-thirds of the energy needed was supplied by power recovery methods, this is reported to be the first time that the full power requirements of the unit have been met by such means. Real secret of the self-sustaining plant is the careful heat balance and the efficient compressor-expander set used.

Air used to oxidize the ammonia enters a 25,000-scfm centrifugal compressor where it is compressed to 120 psi. Compressed air then passes to a preheater where its temperature is brought up to about 550°F. Next the air meets the vaporized ammonia in a gas mixer and combines with it over a platinum-rhodium gauze catalyst. Products pass through a heat exchanger, generating steam which is used to partially power the air compressor.

These cooled reactants then pass through an absorption column where nitrogen oxides are absorbed by water, forming nitric acid.

Waste gases continue on through, are reheated by heat exchange in the reaction zone to about 900°F, and are then

Compressor house at the Atlas Powder plant. Starting at right, turbine drive appears first, with the centrifugal compressor immediately behind it. Expander turbine, next in line after compressor, is not visible. Converter can be seen in left rear

available for expansion in a gas turbine. This turbine furnishes the remainder of power required by the air compressor.

The isotherm compressor used at the Atlas Powder plant has nine impellers on interior which provide nine compression stages. Seven of these act as cooling stages. Air enters one end of compressor, is guided to middle, after which it is directed to opposite end. This arrangement balances thrust.

Waste Gas Drives Turbine

The 900°F waste gas is first used to drive the expander turbine and then to heat boiler feedwater before it is exhausted. Gas leaves plant at a temperature of about 190°F, its energy having been very efficiently used. This heat takes the place of electrical energy and makes the plant self-sustaining after startup. Expander furnishes equivalent of about 3130 kw.

A considerable portion of the nitric acid made at the Atlas Powder plant will be used to manufacture ammonium nitrate in an adjacent facility. More than enough of both of these products will be available to meet company's needs for explosives and other uses. Ammonium nitrate will be available for the fertilizer market.

Approximate capital cost for the 250 ton/day self-sustaining acid plant is about 10 to 15% higher than for a conventional unit of the same capacity costing about $1,700,000. Savings in power more than justify the additional expenditure for the self-sustaining plant.

Plant was started up on May 6, 1958, and during this first test run it operated as designed from a standpoint of capacity and self sufficiency with indications of an excess of steam.

The world's second self-sustaining acid plant is being built for Fisons Ltd., near London, England.

(Nitric acid plant was designed and constructed by The Chemical and Industrial Corp., 256 McCullough St., Cincinnati 26, Ohio.)
Circle 2055 opposite last page.

(Centrifugal compressors and expanders are product of Brown Boveri Corp., 19 Rector St., New York 6, N. Y.)
Circle 2056 opposite last page.

OUR MISTAKE!

We got so wrapped up in "How NOT to Catch a Fish" in April's POWER INDUSTRY (page 14) that we failed to catch the electric fish screen manufacturer's correct name.

Our sincere apologies to Henry T. Burkey and his firm: Electric Fish Screen Company, 1130 N. Poinsettia Place, Hollywood 46, Calif.

The Electric Fish Screen Company designs, manufactures and installs electric fish screens described in the story, and is licensed under Burkey method and apparatus patents.

Major advance in voltage regulation — — Transformer changes turns ratio automatically . . .

Maintains Constant Voltage At Point of Use

A self-regulating distribution transformer which adjusts its turns ratio to maintain a constant output voltage has been developed. Designated SRT (for self-regulating transformer) it changes taps in the primary whenever load changes cause output to deviate 2½% from rated 120 or 240 volts. Band width of the control is about 3½ volts and operation is stable at temperatures from −40 to 150°C.

Newly developed, the unit is available in limited quantities (production schedules call for full output by sometime in early 1959). Ratings initially will be confined to 10, 15, 25, 37.5, 50, 75 and 100 kva at voltages from 2400 to 14,400.

Manual control will enable user to adjust the controlled voltage range of 10% of the full rated output from 90-100% to 95-105% or 100-110%. Automatic control within the transformer housing will then sense secondary voltage, pump a hydraulic fluid to transmit motion via a drive shaft to change the taps to maintain set-point voltage.

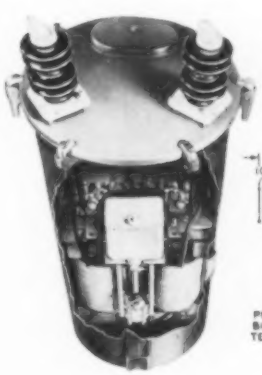
In operation, with a controlled band of 100-110% at 120 v, suppose that a rising voltage reaches 121.75 volts. This is 1.75 volts (or half the band width) above the set point. After a 40 second time delay, taps will change to cut this output to 118.75 volts.

Further rises would require another 20 second delay — time delay is reduced after the first change. And any drop of secondary voltage below 118.25 would start the mechanism on a new change to restore output to a value near 120 volts.

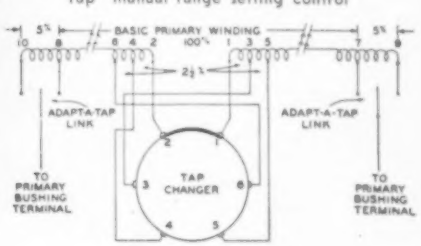
Field tests equivalent to 40 years of service life have been made on the device. Savings estimates in consumer power distribution nets have shown a typical pay-out of two years.

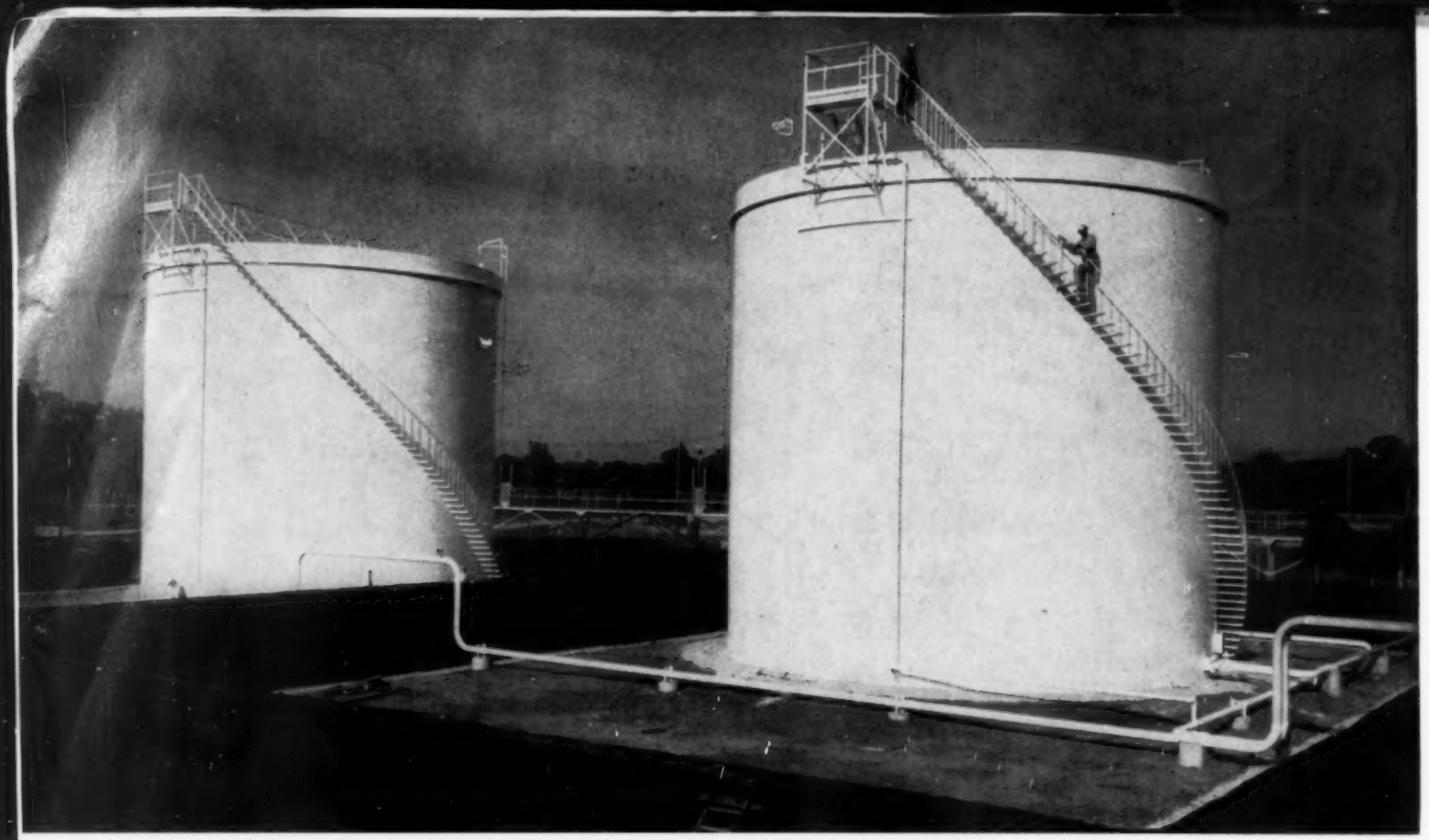
Current design is not recommended for parallel connection in single phase service or delta loads in three phase.

(SRT transformer is a development of Line Material Industries, McGraw-Edison Company, Milwaukee 1, Wis.)
Circle 2057 opposite last page.



Cutaway shows "brain" contained in the transformer. It actuates hydraulic tap changing switch when secondary voltage gets outside limits. Schematic shows connections including the "Adapt-A-Tap" manual range setting control





Westinghouse's Gas Turbine plant is just about the last word in

SAFE STORAGE FOR LIQUID

Its temperature control and fire prevention systems are supplemented by many practical kinks for top safety and efficiency.

by **GEORGE MICHAEL**
Managing Editor

The ultimate in safe handling and storage of explosive liquids has been obtained in a modern installation using jet fuels. It was completed last October at Westinghouse Electric Corporation's Aviation Gas Turbine Division plant in Kansas City, Mo.

The new facility includes two steel storage tanks with a total capacity of 840,000 gal, eight unloading stations, dikes, cooling tower for temperature control, a special fire-extinguishing system, pushbutton remote-control station, and several special innovations.

Up to 20 railway tank cars per hour can be handled by six new unloading stations. They are serviced from loading rack equipped with telescopic bridgeways which permit operator access to tank-car domes without climbing. Each bridgeway is on a swivel at loading rack to provide flexibility in case of accidental car movement. All contact points are rubberized to eliminate sparks.

Drain valves under tank cars are connected to collecting sump to carry away drips and leakage. This prevents accumulation of vapors. For spills, flushing water is provided to each station. Low-pressure steam is available to free frozen valves and heat cars containing heavy oils.

Tank trucks can be serviced at two unloading stations provided with two 500-gpm service pumps with fuel strainers, quick-connect couplings, and transfer manifold to permit discharge to either or both tanks. Supply of every known adaptor is maintained to fit different sizes encountered on various tank trucks.

Each of the two steel storage tanks have 420,000-gal capacity. Both tanks have a Horton double-deck floating roof equipped with insulated pantagraph hangers and stainless steel shunts between sealing ring and roof proper to minimize lightning hazard. This is one of the first American installations to use this protective system. Tanks are 40-ft high and 42½-ft in diameter.

By riding on fuel surface, floating roof eliminates moisture vapor build-up and reduces internal corrosion. Roof is made up of six pie-shaped sections or pontoons. Any two pontoons are capable of floating entire roof in event of

damage or puncture of remaining pontoons.

Roof slopes conically toward a low center where a pantographic pipe arrangement consisting of swivel joints carries off drain water into the dike.

For excessive rainfall, overflow drain is installed to carry water into tank. Later it can be drawn off through a sump.

Liquid level of each tank can be read on gaging device installed outside tank. Thus no climbing or hand-gaging is necessitated.

Surrounding tanks are two rectangular dikes made of clay with a compaction average of 95% density. Three coats of asphaltic oil cover clay surfaces of dikes. The 1:1 dike slope was necessitated by minimum space available.

Inside dikes, drainage system has selective valves to drain off rain water or jet fuel (in case of rupture). Valves remain locked closed until operator determines content of liquid. Oil or fuel is drained into sumps.

Dikes are not pierced with piping. All pipes are connected to tanks through flexible joints to permit expansion, contraction, movement, etc. They go over dike walls at all points.

Semi-Automatic Pumping

Fuel to building containing jet-engine test cells leaves tanks by means of a semi-automatic independent pumping system. After manually placing first pump into operation on line, other pumps automatically begin operating when an orifice-controlled air transmitter determines need for additional fuel. This same device turns off pumps as fuel demand decreases. In case of line rupture, a low-pressure safety valve shuts off all fuel flow. To avoid line rupture, a by-pass system removes excessive pressure, and fuel is automatically recirculated to the storage tanks.

A central control station is installed in an explosion-proof room nearby. Entire fuel system can be shut down by remote control.

In case of fire, liquid-protein foam system will cover each tank roof with one foot of foam in seven minutes. Fire system is operated by either electrical pump or water-injection pump. Foam storage tanks contain a capacity of 800 gal, about a 40-min supply. Fire-extinguishing system was specially designed and includes equipment from several manufacturers.

(Storage tanks were erected by Chicago Bridge and Iron Company, 332 S. Michigan Ave., Chicago 4, Ill.)

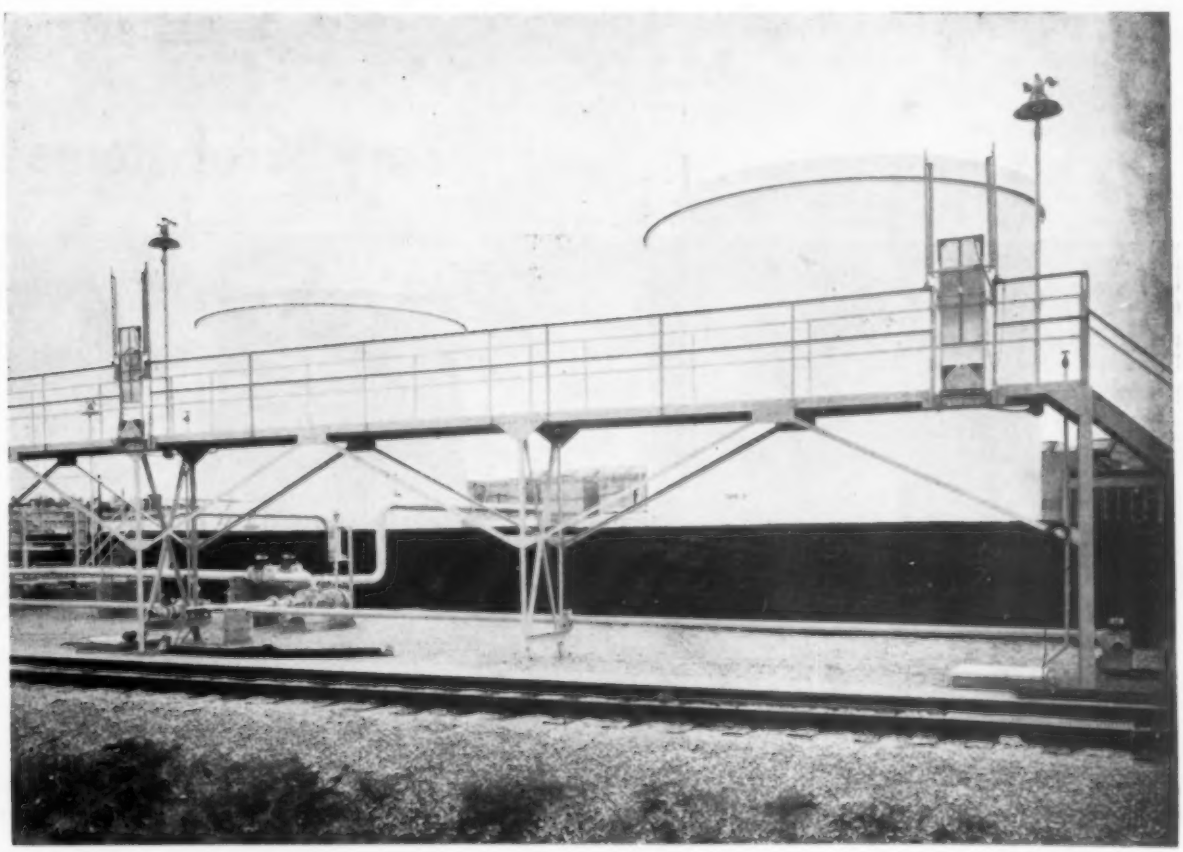
Circle 2058 opposite last page.

(Telescopic bridgeways are manufactured by Par-Ex Machine Co., 9 West Easton St., Tulsa, Okla.)

Circle 2059 opposite last page.

◀ Two 420,000-gal storage tanks at Westinghouse Aviation Gas Turbine Div.'s plant in Kansas City — part of modern new jet-fuel storage and handling system. Tanks are surrounded by dikes to contain rainwater drained from tank roofs or fuel in case of tank rupture. Note dikes are not pierced by pipes — all piping goes over dikes. Liquid-protein foam system will cover each tank roof with one ft of foam in seven minutes

FUELS

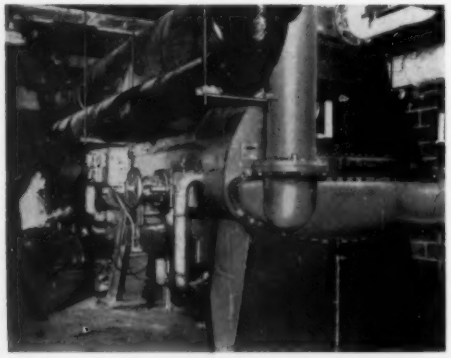


▶ Two of six telescopic bridgeways for unloading railway tank cars is shown at far right of walkway. All are on swivel base to allow for tank-car movement. Contact points are rubberized to eliminate sparks

WASTE PAPER . . .

. . . PLUS INCINERATOR . . .

. . . PLUS REFRIGERATION UNIT . . .



carry ⅓ of store's air conditioning

A. C. ZUCK, Mechanical Design
Syska and Hennessy, Inc.
Consulting Engineers

AMONG the clever stunts (closed-circuit TV monitors, IBM inventory control, electronic conveyorized stock distribution) at Alexander's new White Plains, New York department store, is the waste paper disposal arrangement.

This system gets rid of the bulky heaps of wrappings, boxes and other paper that pile up each day. And in getting rid of it provides about a third of the steam needed for air conditioning the 150,000 square feet of sales space.

The scheme is typical of the engineering which has pared Alexander's overhead by about 15 per cent, compared with conventional department stores in its area.

Waste paper arrives at a collection bin from chutes leading from each of the three sales floors and a penthouse devoted to administration and service. Here, an attendant checks to remove any hangers or merchandise.

After checking, he stokes this paper into the basement incinerator. Usually he handles about 1000 pounds an hour — in peak seasons 1200.

A Scotch-marine waste heat boiler is connected to the incinerator breeching. A bypass arrangement permits flue gas to go up the incinerator stack, if desired.

To regulate production of steam in the waste heat boiler, an induced draft fan and motor operated guillotine dampers are used.

The 4000 pounds of ten psi steam produced each hour are used for domestic hot water or heating during the winter. When warm weather arrives, steam is fed to a seven hundred-ton refrigeration unit.

From Steam: Chilled Water

Since, at peak capacity the 700-ton unit will cool 1570 gallons of chilled water per minute and requires 13,000 pounds of steam, the waste heat boiler can only handle about 30 per cent of peak steam requirements.

Under these circumstances, a control on boiler room's steam header automatically cuts in a boiler burner fired with number six fuel oil.

Usually, however, peak conditions are not reached and the incinerator waste heat boiler "donates" an appreciably larger portion of the required steam. During the spring and fall, the full steam requirement can be met during some of the days.

Using ordinary chilled tap water as a refrigerant, the absorption refrigeration unit discharges at 44°F.

Here's how it operates:

- Water is sprayed into a chamber under high vacuum. Evaporation cools it, producing refrigeration. At the same time a salt (lithium bromide) absorbs the water vapor maintaining vacuum.
- A coil inside this evaporator chamber carries circulating water to be chilled. The free water in the evaporator chamber is sprayed on this coil. Water in the coil is circulated to the refrigeration load.
- Lithium bromide solution is removed by a pump to a generator where steam from the waste heat boiler boils off its excess water vapor. Reconcentrated salt solution is returned to the evaporator.

- Water vapor boiled off the lithium bromide solution is condensed and returned to evaporator.

In addition to this basic set up, a heat exchanger takes heat from the hot concentrated salt solution to preheat cooler weak salt solution before it is concentrated. Too, condenser water from a roof top cooling tower is used in coils in the absorber and condenser to remove waste heat from the refrigeration cycle.

One of the factors which swayed President George Farkas of Alexander's to this scheme is a continual fluctuation in the market value of waste paper. As a low-cost "bonus" fuel, it has an easily figured value to the store.

And the scheme adopted here has another advantage in cutting down personnel requirements and storage space. There are no baling operations, no valuable dock space taken up by low-value paper bales.

(700-ton absorption refrigeration unit used at Alexander's is a product of Carrier Corporation, 300 South Geddes St., Syracuse 1, N. Y.) Circle 2060 opposite last page.

load

Power Picture for 1983

(*Continued from page 13*)

monetary value, or complexities resulting from the many sources of supply and possibilities for use.

A more striking measure of the energy problem is that the retail value of the energy consumed in 1955 is estimated at $40 billion, or 10 per cent of the Gross National Product. In 1975, it will probably be $75 billion assuming steady prices and constant dollars.

If the constant dollar price increased only 10 per cent between 1955 and 1975, the additional $7.5 billion would provide an exceedingly worthwhile incentive for more economical use of energy resources.

Where such large amounts of energy and money are involved, it is not surprising that there is such a diversity of opinion.

The many points of view indicate the need for more accurate and careful studies of all phases of the problem and the need for a general understanding of the situations that may develop in the future in providing an energy supply that will safeguard the nation's security and promote its economic well-being.

Complex interrelations

Some of the complexities are due to a broad spectrum of industries and various regions drawing from the same pools of energy resources. Also, there is the competition between energy sources.

An example will illustrate some of the interrelations that exist in the supply and use of energy sources, and indicate the magnitude of the complex conditions that occur in supplying energy:

The petroleum industry supplies gasoline for automotive and aviation purposes but also supplies a nearly equal amount of oil products, such as fuel oils, lubricants, and special chemicals used by many industries.

Demand for various petroleum products can vary over a wide range.

Increased production of one of them, gasoline for example, may produce a surplus of another product such as residual fuel oil for use by ships, electric generating stations, and a number of industries.

A surplus of residual fuel oil can result if the increased production of gasoline is obtained by processing a greater quantity of crude oil by essentially the same refining methods.

More fuel oil

However, if refining methods are improved, a greater yield of gasoline can result from the same quantity of crude oil and a reduction in the amount of residual fuel oil.

The resultant price changes accompanying a surplus of residual fuel oil can make it advantageous for some industries to shift from coal to oil, although there may be serious economic effects on the coal industry.

The current situation of surplus residual fuel oil replacing the coal normally used in some areas has been a contributing factor in reducing coal production the past few years. Economic or technological developments may easily change these conditions so that there will be no surplus of residual fuel oil.

Since each of the energy sources is used by a number of groups and for many different purposes, the problems in analyzing the future utilization of energy sources appear quite complex.

Analyzing industry's problem

But by properly breaking down the overall problem into its components, an analysis and guide for the future can be made for any of the supplying or using groups to indicate the most economical utilization of the sources of energy.

An obvious problem is that of industrial plants. Industries relying on some form of energy as a major ingredient in manufacturing operations should be able to forecast and plan for their needs and select plant locations to obtain the most advantageous use of available sources of energy.

At the same time they should be able to give full consideration to the other factors that affect the selection of the plant site.

Another important factor in the economical use of energy sources is the transportation of energy materials from source to point of use.

Conventional sources of energy — petroleum, natural gas, coal and water power — are located, for the most part, at considerable distances from the present heavy load centers, making transportation an important item in the cost of energy delivered to the point of use.

About two-thirds of the coal and lignite reserves and well over three-fourths of the petroleum and natural gas reserves are west of the Mississippi River and are thus remote from the large energy demands of the industrial East.

The major reserves are also some distance from the load centers of the West.

Emphasis on plant location

Relocation of major segments of industry may be a better solution to the problem than the transmission of large blocks of energy over very long distances.

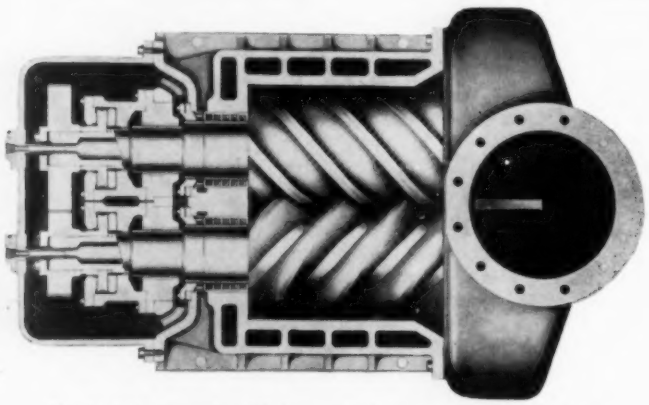
Most studies in the past indicate that bulk transportation of energy can be accomplished more cheaply by shipment of fuel than by conversion to electrical energy and utilization of electrical transmission.

However, the great increases projected in energy demand will place exceedingly great strains upon existing transportation systems if fuel is shipped from basic sources to the more concentrated load centers. It may well be that the cost of shipping fuel under such conditions will not be as economical as in the past.

Moreover, recent studies show that when very high voltages are utilized for the transmission of large blocks of electrical energy, the cost of transmission can be competitive with the shipment of fuel under conditions expected in the future. ■

NEW DEVELOPMENTS

power—power services—maintenance



Standard single- and multi-stage units have capacities from 800 to 13000 cfm

Positive displacement compressor

- **high efficiency**
- **low size and weight per cfm**
- **oil-free air at 60 or 150 psig**

Rotary impeller design has been popular in Europe; fits between centrifugal and reciprocating types

Based on a popular European design, rotary positive-displacement compressor is generally intermediate between centrifugal or turbine compressors and reciprocating compressors. Standard capacity range runs from 800 to 13,000 cfm with pressures of 60 or 150 psig. Efficiency is relatively high, size and weight are low for the capacity, and design offers low maintenence, oil-free air.

Overall adiabatic efficiency has been shown to be higher than any known type of rotating, general purpose industrial compressor equipment. Design makes use of two helical-lobe impellers with axial flow.

Power impeller has four lobes: matching secondary impeller has six synchronized gaps.

These impellers rotate with a rolling motion — power is transmitted to secondary impellers through cushion of compressed gas. There is no metal-to-metal contact between impellers or the surrounding casing, thus lubrication of impellers is unnecessary.

With no lubrication, oil-free air is delivered. Maintenance is kept low because no valves or pistons are used.

Since exhaust port opens on the arc where impellers are meeting, interlobal space is reduced to zero before passing the port. Flow of compressed gas is thus continuous with minimum pulsation or vibration.

Construction makes use of water-jacketed cast block with large cast impeller and smaller impeller of forged steel. Construction materials can be varied to meet requirements where vapors or gases other than air are being compressed.

Variety of Sizes

Five standard cases and impeller sizes in single and multi-stage units are available. Single-stage compressors handle a range of compression up to 5 to 1 (discharge at 60 psig for atmospheric intake). Single stage capacity extends from 800 to 13,000 cfm.

Two-stage compressors — with external intercoolers — offer compression ranges up to 11 to 1 (discharge at 150 psig for atmospheric intake). Capacity for the two stage units ranges from 2000 to 13,000 cfm.

Because of high operating speed, compressor can be efficiently driven by induction or synchronous motor, diesel or natural gas engines, steam or gas turbines.

(Rotary compressor is a product of Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago, Ill.)
Circle 2061 opposite last page.

Quick-break device reduces arcing

Power-switching accessory reduces arcing hazards and prevents phase-to-phase faults. Quick-break device aids in switching light loads, line-charging currents, and transformer magnetizing currents.

Speed of rod tip is independent of speed of opening switch

Other features include simplicity of field installation, isolation of beryllium-copper rod from current path when switch is closed, and controlled rod action after an interruption.

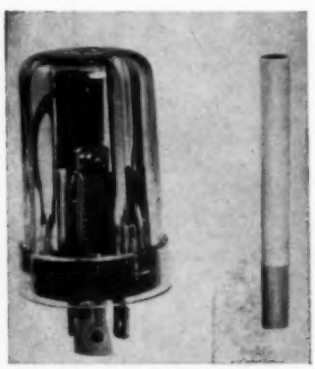
(Quick-break device is a product of the Line Material Company, Milwaukee, Wis.)
Circle 2062 opposite last page.

For outdoor lights: simple photocell plus relay

Simplicity is achieved by using only two components in this automatic photo control. Snap-action single-throw relay (15 amp) is operated by cadmium sulfide photocell.

Entire unit measures 2¾ x 1¾ inch diameter. It is enclosed in weatherproof plastic housing.

Designed specifically for 115-125v, 25/60 cps, control operates satisfactorily in the range 105-130v at these frequencies. Power dissipation is 2.8 watts in daylight; 0.005w at night. It controls total of 1800 watts.



Cigarette shows size of 1800-watt control

Operational range is factory set for one to six foot candles. Temperatures of −40 to 170°F do not affect operation.

(Photo control is made by Precision Magnetic Controls, Inc., 34 Cottage Place, Ridgewood, N. J.)
Circle 2063 opposite last page.

Automatic precision in expanding tubes

Maintenance cost cutter for users of package fire-tube boilers, tube expander control ensures uniformly rolled tubes.

Air-driven automatically controlled tool eliminates variables caused by over or under rolling, assuring uniform distribution of expansion stresses throughout tube sheet when boiler is operating.

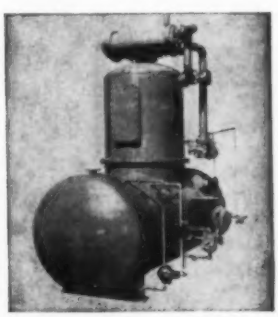
Calibrated dial is set at required torque. When this point is reached, tool stops rotating.

(Torq- Air- Matic expander control is manufactured by Thomas C. Wilson, Inc., Long Island City, N.Y.)
Circle 2064 opposite last page.

Dual controls monitor feedwater heater

Dual liquid-level control automatically switches feedwater heater from primary to secondary water supply at a preset low.

Ideal for installations where primary supply of makeup water is not dependable. Control also sounds alarm when water reaches preset high point in storage section.



Feedwater heater with dual liquid-level control

Control is available for Stickle deaerating and non-deaerating feedwater heaters of any storage capacity producing 3000 to 300,000 pounds per hour.

(Feedwater heater control is a product of Stickle Steam Specialties Co., 2215 Valley Ave., Indianapolis 18, Ind.)
Circle 2065 opposite last page.

"The best laid plans . . ."

. . . get lost. This rack (24 x 36 x 48" high) keeps them where they can be found. Each clip holds 100 blueprints. There are seven clips.

Clips slide out of the rack for inspection of the prints. And new prints can be added — or old ones removed — without disturbing the order.

("Glider 700" storage rack is made by Momar Industries, 4323 W. 32nd St., Chicago 23, Ill.)
Circle 2066 opposite last page.

Hinged incinerator hood makes for easy loading of 20 bushels

With a capacity of 20 bushels, aluminized steel incinerator is designed for small to moderate refuse disposal in limited areas.

Safety features are important. Unit can be used ten feet from buildings. Good draft control permits burning damp refuse in any weather without danger of blowing burning material from the stack.

Cleanout door is wide enough to permit large shovel to be used. Unit stands 78 inches high and is just under three feet square.

It is shipped fully assembled ready to be used.

(C20 incinerator is a product of Alsto Co., 4007 Detroit Ave., Cleveland 13, Ohio.)
Circle 2067 opposite last page.

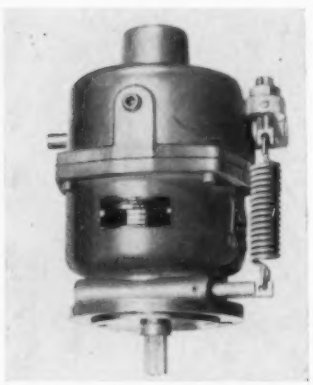
Circle 2068 opposite last page

Holds diesel, gas engine steady up to 2400 rpm

Designed for use as main speed control on small engines or as an overspeed governor on larger engines. Mechanical flyball governor has also been used on steam turbines.

Constant speed range of the unit is 500 to 2400 rpm; variable speed range 500 to 1440 rpm. Torque capacity is 30 inch-pounds at 1200 rpm.

Governor can be supplied with permanently attached flexible drive. This drive is



Flyball governor develops 30 inch-pounds at 1200 rpm.

effective in absorbing cyclic speed variations.

(Type 2300 flyball governor is a development of Farris-Pickering Governor Co., Inc., 624 Commercial Avenue, Palisades Park, N. J.)
Circle 2069 opposite last page.

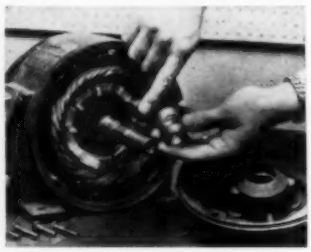
Quiet motor design uses fluid-fiber in bearings

Acts like felt wicking; holds oil three times as long

Sleeve bearing AC motors from ¾ to 15 horsepower are now being made with a different system of bearing lubrication. One goal of the design is quieter operation in air-conditioning and pumping operations.

These polyphase motors are available in all standard enclosures for operation at standard NEMA voltages from 208 through 550.

Unconventional bearing design makes use of a patented fluid-fiber material. This material combines oil with fibers in a plastic paste extruded into bearing cavities. Manufac-



Fiber-oil paste is extruded in the bearing case cavity

turer's tests show that oil is held in the bearing three times longer than felt wicking would hold it.

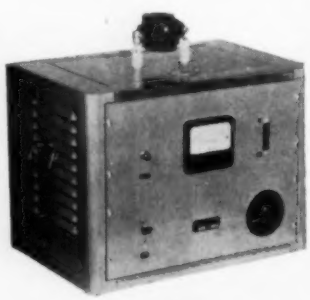
These motors can be mounted horizontally on ceiling, wall, or floor to conserve mounting space.

("Liquimatic" bearing motors are a development of Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio.)
Circle 2070 opposite last page.

Variable voltage to 35 kv for testing oil, fluids

Any insulating fluid can be tested to 35 kv in variable high voltage test unit.

Designed to test transformer oil and similar liquids with ASTM and Federal specifications, unit is designed for use



Rate or rise control can be built-in

by maintenance engineers working with high voltage equipment.

Design specifications of the 0-35 kv AC tester are:

- 2 KVA capacity to ASTM, Federal specs
- Continously variable controlled voltage
- Accurate test voltage metering directly across electrodes

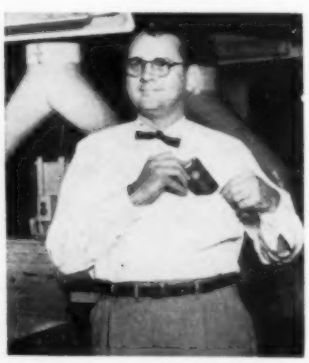
Automatic built-in motor driven rate of rise control is available to raise test voltage at 3 kv/sec.

(Model 4505 tester HYPOT is a product of Associated Research, Incorporated, 3777 West Belmont Ave., Chicago 18, Ill.)
Circle 2071 opposite last page.

For more information on items reported in the New Developments section, circle corresponding numbers on reader service card opposite last page.

Size of cigaret pack, pocket radio pages anywhere in plant

Designed for key personnel who must often be called to the phone or their office, radio paging unit can be con-



Vibration means "pick up the phone"

veniently carried in shirt pocket. It is about the size of a pack of cigarettes.

Designed to overcome the problem of high noise levels, radio receiver signals its wearer by vibrating. Vibration lasts for a few seconds; can be repeated by operator.

Entire systems consists of master console, remote booster amplifiers, and the receivers. Entire plant area to be serviced is equipped with an easily installed "loop antenna."

At AC spark plug division of General Motors (where unit was developed) about 80 receivers are in use — 200 are expected to be put to use shortly.

Personal code

Each person to carry a receiver has his own code designation. Only he receives vibration "message" when he is needed.

Code system now in use permits 380 receivers to be operated from each console. Each receiver is 3¾ x 2½ x 1¼ inches and weighs about seven ounces.

Receivers are battery-powered, transistorized radios. They operate below the standard broadcast frequency. No FCC license is needed.

(Vibacall paging system is a development of AC Spark Plug Division, General Motors, Flint 2, Mich.)
Circle 2072 opposite last page.

Refractory furnace floor speeds slag removal

Refractory floor material is recommended for stationary and marine boilers. It is formulated to eliminate chipping methods usually required for slag breakup and removal.

Made from periclase (a dense crystalline magnesia) it is a crumbly material.

In normal application, refractory is spread to a depth of three inches over boiler floor. It replaces top course of refractory brick, usually.

Slag built up in the course of operation is allowed to accumulate to the neighborhood of 10 inches. Then refractory and slag — still crumbly — are cleaned out.

(Oceanite refractory is a product of Kaiser Aluminum & Chemical Corp., Kaiser Bldg., 1924 Broadway, Oakland, Calif.)
Circle 2073 opposite last page.

NATIONAL AIROIL

Oil Burners

OF THE STEAM AND MECHANICAL TYPES NOW COMBINED INTO

Dual Stage BURNERS

Now, at last, the inherent advantages of *both* systems of fuel oil atomization are *profitably* yours . . . within the one, new NATIONAL AIROIL Dual Stage Burner.

46 years of combustion equipment design and manufacture are in back of the Dual Stage Oil Burner . . . and, it has been thoroughly tested and proved in the field for firing: Petroleum Processing Heaters; Rotary Kilns; H.R.T., Scotch Marine and Water Tube Boilers; etc.

Available in three sizes, the NATIONAL AIROIL Dual Stage Burner fires all grades of fuel oil from No. 2 to No. 6, with a ready capacity of 80 to 300 g.p.h. Further, for a perfect flame pattern, we would recommend using with the Dual Stage Burner either the NATIONAL AIROIL Universal Register for forced draft or, the NATIONAL AIROIL Tandem Unit for natural or induced draft furnaces.

Get detailed description, illustration, and specifications in NATIONAL AIROIL Bulletin 25.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS, Steam Atomizing
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
AIR INTAKE DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

Established 1912 — *Incorporated 1917*

NATIONAL AIROIL BURNER COMPANY, INC.

1350 E. Sedgley Ave., Philadelphia 34, Pa.
S. W. Division: 2512 So. Blvd., Houston 6, Texas

Circle 2074 opposite last page

CUT HERE AND FILE

POWER INDUSTRY nomograph No. 7

Pressure Drop Through Pipe Fittings

By D. S. DAVIS
Head, Pulp and Paper Technology
University of Alabama

Pressure drop through pipe fittings is given by

$$h = \frac{KV^2}{64.4}$$

where—

h = pressure drop, feet of fluid flowing (ft)
V = velocity of fluid (fps)
K = resistance coefficient which depends on diameter of fitting[1]

Nomograph presented here solves the equation conveniently and accurately.

Typical Example

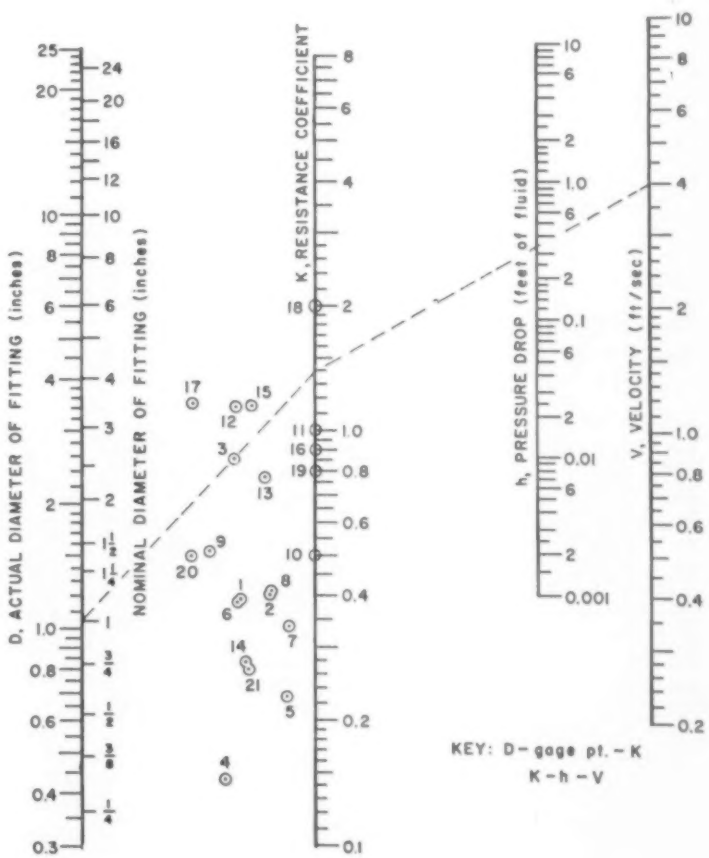
What pressure drop can be expected through a 1" regular screwed returned bend when velocity of fluid is 4 feet per second?

Connect one inch on diameter scale with gage point 3 (for regular screwed return bend — see table). Straight line through these points intersects K scale. Connect this K scale intersection with 4 on V scale and read pressure drop on h scale as 0.34 ft of fluid.

LITERATURE CITED
(1) "Pipe Friction Manual", p 28-29, Hydraulic Institute, New York (1954)

Key To Nomograph Gage Points

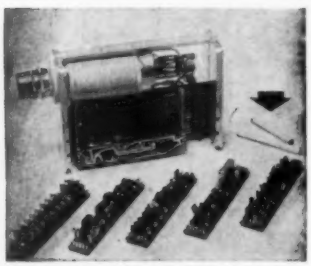
Gage Point	Description of Fitting
1	Long radius flanged return bend
2	Regular flanged return bend
3	Regular screwed return bend
4	Couplings and unions
5	Long radius flanged 45° ell
6	Long radius flanged 90° ell
7	Regular screwed 45° ell
8	Regular flanged 90° ell
9	Long radius screwed 90° ell
10	Regular screwed 90° ell
10	Square-edged inlet
11	Inward projecting pipe
12	Basket strainer
13	Flanged tee, branched flow
14	Flanged tee, line flow
15	Screwed tee, branched flow
16	Screwed tee, line flow
17	Screwed angle valve
18	Flanged swing check valve
19	Foot valve
20	Flanged gate valve
21	Screwed gate valve


D, ACTUAL DIAMETER OF FITTING (inches)
NOMINAL DIAMETER OF FITTING (inches)
K, RESISTANCE COEFFICIENT
h, PRESSURE DROP (feet of fluid)
V, VELOCITY (ft/sec)
KEY: D – gage pt. – K
K – h – V

Transistor TV — called smallest

Industrial TV camera unit is fully automatic and self-contained. No larger than a book (2⅜ x 5⅜ x 7¾") it compares with high definition cameras weighing more than 100 pounds.

All tubes have been replaced by transistors. Printed circuits are used.



Cigarettes (arrow) show size of four-pound TV camera

A feature of the camera is an automatic electronic light adjustment compensating for light level changes to ratios as high as 250 to 1.

(Transistorized TV camera is a development of Dage Television Division, Thompson Products, Inc., Michigan City, Indiana.)
Circle 2075 opposite last page.

Small controller fits pressure, temp or level use

Indicating controller has been designed for low cost pneumatic applications. It provides two-position or wide-band proportional control with or without automatic reset or rate action.

Measuring 8½ x 8½ x 4 inches deep, it may be surface or flush panel mounted. Its indication is shown on precision gage dial 6¾ inches long.

Modes of control include:

- Two-position with differential gap, adjustable from 1 to 100%
- Proportional control, adjustable 1 to 100% (1 to 150% if specificied)
- Proportional control (1 to 150%) plus automatic reset or rate action.

A simple alteration converts direct action to reverse action. For temperature measurements variety of thermometer bulbs and fills achieve a composite range from −350 to 1000°F. All thermal elements

Versatile low-cost controller may be surface or panel mounted

are interchangeable with pressure measuring elements.

Pressure ranges extend from 0-15 to 0-10,000 psi.

Other process variables such as vacuum, liquid level, differential pressure or flow, specific gravity, motion, force or tension can all be handled.

Accuracy of indication is 1% at mid-scale, 1½% at extremes. Sensitivity is better than 0.1% of full scale at 100% proportional band.

("Pilot" indicator controller is a development of U. S. Gauge Division of American Machine and Metals, Inc., 103 Clymer Avenue, Sellersville, Pennsylvania.)
Circle 2076 opposite last page.

Support for anion bed needs minimum washing, "regeneration"

Eliminating need for sub-fill media, anion bed supports substantially reduce rinse and regeneration requirements for anion exchange units. The support is similar to those specifically designed for mixed-bed demineralizers.

Support medium allows passage of water in either direction. It retains resins and provides for uniform collection or distribution over entire cross section of the bed.

Interesting quirk in the history of this support: Laboratory investigating high rinse and regeneration requirements for anion exchange resin found that the "regeneration" and rinse was needed by the support bed. Sodium hydroxide used in the regeneration remained in the anion unit even after it had been rinsed out of the resin bed itself.

This, of course, required additional rinsing to lower conductivity to acceptable levels. Considerable savings in operating costs can be achieved by using this low hold-up support bed.

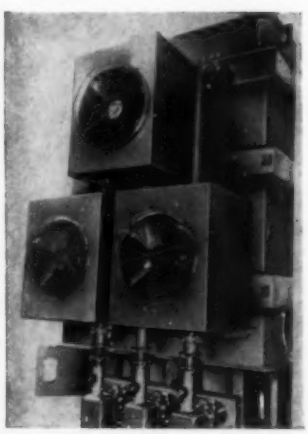
(Resin support bed is a development of Graver Water Conditioning Co., 216 West Fourteenth Street, New York 11, New York.)
Circle 2077 opposite last page.

Transformer oil cooler to be future standard

Standard for new power transformers by this manufacturer, new oil cooler is smaller, lighter.

Design has improved field assembly, interchangeability, auxiliary power requirements.

This unit weighs in at 850 pounds vs 4000 for older 9-fan



Weight of cooling unit is only 850 pounds.

cooler. High pressure, low velocity fan is used. Power to the fan is 220 or 440 volts.

(Oil-to-air unit cooler is a development of Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.)
Circle 2078 opposite last page.

Protect large units with 6 to 16-inch 300 psi strainer

Strainer will protect boiler feed, condensate and circulating pumps or other equipment in large (6 to 16 inch) lines.

Steel construction is rated for 150 or 300 psi. Strainers will knock out dirt, mill scale, and other debris common to new piping systems.

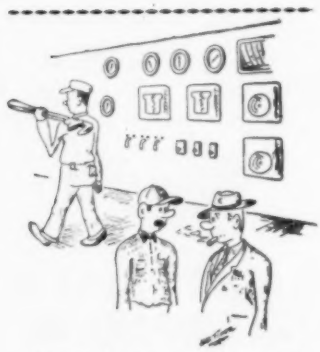
Straight-through design holds pressure drop at a minimum. Removable screen can be taken out for inspection or

Steam or water lance speeds cleaning

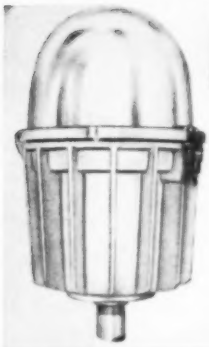
cleaning without removing strainer from the line. Or, an air, steam, or water lance will flush trapped debris into cleanout drain.

This cleanout drain is threaded for cap or gate valve.

(Strainer is a product of Leslie Co., 222 Delafield Ave., Lyndhurst, N. J.)
Circle 2079 opposite last page.



Oh, him! He's our instrument men.



Newest and Finest

Industrial Beacon Ray Warning Light

Where you need a warning you need the best warning

The adaptability and success of the model 275 Beacon Ray created demand for an even more powerful and more rugged warning light. The new Beacon Ray Model 271 more than doubles the intensity and range of prior designs. It can mount on a 1" pipe or on a flat surface. It has a substantial cast aluminum housing and a heat resistant glass dome which houses a mechanism that rotates a single, powerful sealed-beam spot lamp. The hinged cover with single clasp, facilitates relamping and inspection. The Model 271 Beacon Ray is built for real service and full dependability! The only revolving warning light with adjustable tilt-beam feature. Write for bulletin on the new Beacon Ray Model 271 light today.

FEDERAL SIGN and SIGNAL Corporation

8709 South State Street, Chicago 19, Ill.

Circle 2080 opposite last page

OUTSTANDING FOR STEAM SERVICE

JOHNSON Direct Operated SOLENOID VALVES

Stainless steel valve and seat. Sizes: ½" to 3". Write for facts.

Job after job, these Johnson Direct Acting Solenoid Valves are proving an ideal answer for service on steam lines. Their design removes the solenoid proper from the heat of the line, permits a leverage system with ample power to open against differential pressures up to 150 lbs. There are no pilot valves or auxiliary pistons, and construction is really heavy duty throughout. You will find their inherent simplicity and instant response will solve a lot of operating problems like no other valve can.

THE JOHNSON CORPORATION

807 Wood St., Three Rivers, Mich.

Circle 2081 opposite last page

CUT HERE AND FILE

POWER INDUSTRY nomograph **No. 8a**

Controlling scale formation in water treatment

by M. R. BEYCHOK
Rothschild Oil Co., Santa Fe Springs, Calif.

This method of controlling carbonate and sulfate scale formation in treated-water circulating systems is based on comparing calculated quantities with those actually found in lab analysis. Accompanying nomograph (page 27) provides a short-cut method of making calculations.

Starting with lab reports showing chlorine content, hardness, sulfate ion, and alkali at both the feed end and cooling tower of the system, one can compare calculations of predicted and actual quantities in two cases to check carbonate and sulfate scale separately.

Carbonate scale is checked by comparing chloride concentration ratio with hardness concentration ratio.

Sulfate scale is checked by comparing actual sulfate content at the tower with sulfate content predicted there. If actual content is less than that predicted, excess is going into scale.

Carbonate Scale

To see whether carbonate scale is forming, collect these data:

- Chloride ion content in feed and at tower, ppm
- Hardness in feed and at tower, ppm of $CaCO_3$

Then —

- Connect "Chlorides in Feed" with "Chlorides in Tower" and read "Chloride Cycles" on nomograph
- Connect "Hardness in Feed" with "Hardness in Tower" and read "Hardness Cycles"
- Compare values . . . if "Hardness Cycles" are larger than "Chloride Cycles," *no carbonate scale is forming.* If "Chloride Cycles" are larger, *carbonate scale is forming*

Sulfate Scale

In addition to foregoing data, sulfate ion content (ppm) and alkalinity (ppm $CaCO_3$) must be known. With aid of nomograph, these data yield information to solve this equation:

Tower $SO_4^{=}$ = (Feed $SO_4^{=}$) (Cycles) + 0.96 [(Feed Alkali) (Cycles) − Tower Alkali] (Term in brackets accounts for sulfate added as H_2SO_4 for pH control. Coefficient 0.96 is ratio of equivalent weights of sulfate ion and calcium carbonate.)

Nomograph is used this way for sulfate scale:

- Connect "Chloride Cycles" to $SO_4^{=}$ in Feed" and read "A"
- Connect "Chloride Cycles" to "Alkali in Feed" and read "B"
- Connect "Alkali in Tower" to "Reference Point" and read "C"
- A,B, and C are the three unknown terms in the right hand member of the equation, so

$$A + B - C = \text{Tower } SO_4^{=}$$

Solve for sulfate ion at the tower and compare it to the actual value. If calculated value is higher, sulfate scale is being formed.

Typical Example

Water analysis by laboratory shows:

	Parts per Million	
	In Feed	At Tower
Chloride ion	89	400
Hardness (as $CaCO_3$)	122	450
Sulfate ion	20	1012
Alkali (as $CaCO_3$)	350	300

Connect 89 ppm chloride ion in feed with 400 ppm chloride ion at tower and read number of chloride cycles as 4.5.

Now connect 122 ppm hardness in feed with 450 ppm at tower and read hardness cycles as 3.7. Since number of chloride cycles is greater than the number of hardness cycles, *carbonate scale is forming.*

Then connect 4.5 chloride cycles with 20 ppm of sulfate ion in the feed and read A as 90 ppm.

Connect 4.5 chloride cycles with 350 ppm of alkali in the feed and read B as 1510 ppm. Finally, connect 300 ppm alkali at the tower with the reference point and read C as 288 ppm.

Sulfate ion, then, should be 90 + 1510 − 288 or 1312 ppm. Since lab test shows only 1012 ppm, *sulfate scale is forming also.*

(Continued on page 27)

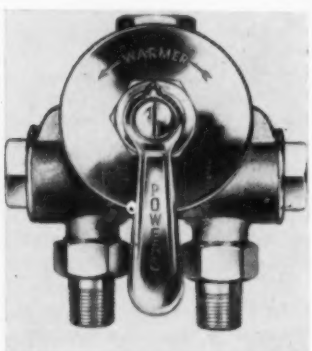
Courtesy of Chemical Processing

Mix flowing water, steam safely

Wherever hot water (up to 200°F) is needed at rates to 14 gpm, this mixer can make it from live steam, cold water.

Principal feature of the mixer is its ability to maintain given temperature regardless of flow changes in steam or water supply line — thus protecting workers from scalding.

Floating piston controls and equalizes flows of the two fluids as they enter mixing chamber. It compensates for



Maintains output temperature despite line pressure changes

variations in the supply lines. Check valves are built in to prevent interchange of steam and cold water when mixer is not in use.

(Style D mixer is a product of Powers Regulator Company, 3434 Oakton St., Skokie, Illinois.)
Circle 2082 opposite last page.

Protect hot surfaces — aluminum paint is good to 1700°F

Aluminum is formulated with combination of "non-leafing" and "leafing" aluminum. Non-leafing particles remain distributed in the vehicle when paint is applied. Resulting structure of cured paint coat allows coating to withstand 1700°F.

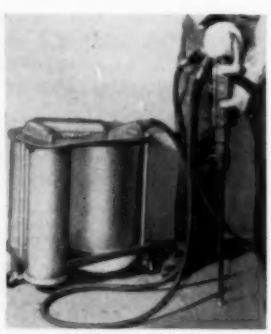
Leafing aluminum particles rise to the surface when paint is applied. This forms a bright elastic finish resistant to moisture, corrosion, mild acids, alkalis, and fumes.

Paint is thus recommended for use on hot ducts, traps,

Paint dries at room temperature

stacks, vents, compressors, ovens, engine heads, mufflers, radiators, exhaust manifolds, etc. It will dry at room temperature.

(Heat-Rem H-170 is available from Speco, Inc., 7308 Associate Ave., Cleveland 9, Ohio.)
Circle 2083 opposite last page.



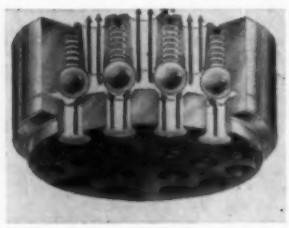
No flying dust

. . . because this air hammer "inhales" dust and chips as they are formed. They are sucked through hollow bit (7/8 to 1 3/8 inch diameters) and vented to plastic collecting sack.

(15-DL dustless drill is a development of Thor Power Tool Company, Prudential Plaza, Chicago 1, Ill.)
Circle 2084 opposite last page.

New concept in valves for compressors

Flat plates or poppets for heavy-duty ammonia compressor suction and discharge valves have been replaced with multiple steel balls. The result is less resistance, better seating, greater life, and improved performance. Ball



Ball valves have less resistance, longer life

valve passes 26% more gas than previous valve types. Benefits are that gas flows freely around a ball with minimum restriction, and ball revolves, seating on a different part of its surface with each piston stroke.

Valves are quiet in operation and vibration free.
(BV Ball Valves are products of The Ball Valve Company, 5512 Oak Street, Kansas City, Missouri.)
Circle 2085 opposite last page.

Penetrates masonry 3/8" and waterproofs it

Silicone base water repellent is designed for masonry surfaces. Manufacturer's tests show it reaches 3/8 inch pene-

Partially treated cement block shows effect of coating

tration within one hour after application.

A completely colorless liquid, the coating dries to be invisible on masonry surfaces. While it waterproofs them, it permits the surface to "breathe" freely. It may be sprayed or brushed on brick, concrete, stucco, stone, unglazed tile, mortar joints, asbestos shingle.

Treated walls tend to shed dirt and stains normally caused by water. Manufacturer recommends best time of application as immediately after any sandblasting treatment.

Applied just before winter season, it can prevent normal surface deterioration incident to freezing and thawing.

(Silicone base masonry coating is a product of National Asphalt Corp., Cleveland 15, Ohio.)
Circle 2086 opposite last page.

Line test flashlight handy in dark

Electric testing device is combined with compact battery-powered flashlight in an unbreakable case. Especially valuable for checking during

Voltage and continuity checker contains pen light cells and bulb.

partial and total power failures, instrument checks voltage from 60 to 440 volts, checks continuity.

It will also indicate whether source is AC or DC.

Flashlight power is provided by two penlight cells and it is provided with its own 12 inch test leads.

(Meter-Lite is a product of Cessco Ind., 55 Church St., Albany 1, N. Y.)
Circle 2087 opposite last page.

ROBINTRONIC

AUTOMATIC LEVEL INDICATOR FOR BULK MATERIALS HANDLING

Single Unit

One probe and complete self-contained electronic control unit.

Dual Unit

Two independently operating probes and single control unit.

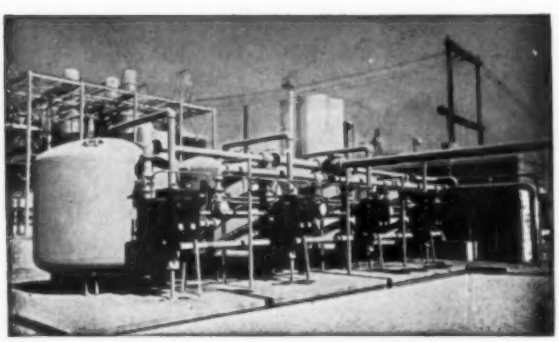
This accurate, easily installed electronic unit actuates an audible or visible signal to warn operators when materials vary from the pre-set level. When equipped with a power relay, it can also control the flow of materials by stopping and starting motors and other equipment.

RoBINtronic requires neither adjustment nor lubrication. It is engineered for heavy industrial service and functions with materials of all densities from rock and coal to grain and sand.

Send for free Bulletin 166, Department R, Hewitt-Robins, Stamford, Connecticut.

HEWITT-ROBINS

Circle 2088 opposite last page



BOILER FEEDWATER TREATMENT

(for over half a century)

Complete plants for water softening, demineralization, silica removal, de-oiling of condensate, clarification, de-alkalizing and all other requirements.

Send for Bulletin BFT-11 or Nearest Field Representative.

HUNGERFORD & TERRY, INC.

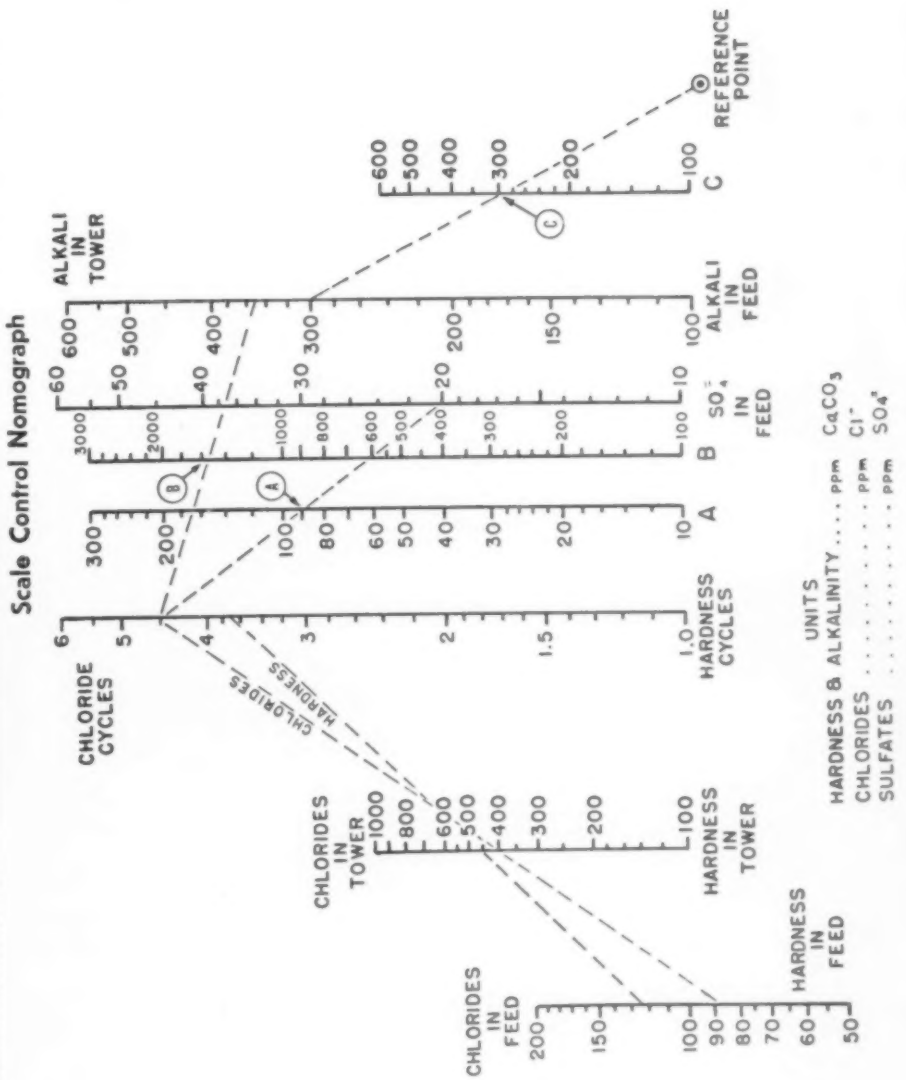
CLAYTON 1, N. J.

Circle 2089 opposite last page

CUT HERE AND FILE

POWER INDUSTRY — No. 8b

Scale Formation – cont.



Courtesy of Chemical Processing

NEW LITERATURE

power—power services—maintenance

Reviews of books and industrial bulletins describing equipment, supplies, services

High efficiency scrubber with five variations

Bulletin describes scrubber that is guaranteed to remove 99.5% or more of all solid or liquid entrainment in gas or vapor.

Cut-away views of scrubbers with a spray ring and with an internal liquid feed show operation method.

Five design variations that make scrubber applicable to most fields, including refineries, food processing, gas processing and transmission, pharmaceutical manufacture, steam generation, incinerators, and steel mills are described.

(Bulletin No. 500 is available from Centrifix Corporation, 3608 Payne Avenue, Cleveland 14, Ohio.)
Circle 2090 opposite last page.

Tells how to insure faster steam

Twelve-page bulletin describes line of package boilers that fire gas or oil. Points out the extra engineering you get, all of which adds up to faster, lower cost steam.

Photographs show details of construction, and large cutaway shows hidden features. Includes section on burners and table of specifications.

(Catalog SB-59 is available from Erie City Iron Works, Erie, Pa.)
Circle 2091 opposite last page.

Save labor when you next couple lightweight pipe

Method of quick-coupling lightweight pipe or tubing is reviewed in the six-page bulletin. Details installation and operating features, explains how use of lightweight pipe with roll-grooved ends effects savings, and illustrates typical applications.

Drawings show how couplings form a positive, leak-tight seal under pressure or vacuum. Explains how design permits quick disassembly for reuse, removal of individual lengths without disturbing adjoining sections.

(Vic-Easy Bulletin is available from Victaulic Company of America, PO Box 509, Elizabeth, N.J.)
Circle 2092 opposite last page.

Why do you need engineered mountings?

Bulletin describes the benefits of using engineered mounting systems, and damage to vital equipment caused by inefficient damping.

Shows test equipment available for diagnosing your troubles with vibration mountings.

(Bulletin No. F1A is available from Federal Shock Mount Corporation, Division of The Korfund Company, Inc., 1060 Washington Avenue, New York 56, N.Y.)
Circle 2093 opposite last page.

High pressure pumps in seven sizes

Seven models of high pressure gear pumps are described in four-page catalog section. Capacity bracket is 1.2 to 14.2 gpm with a top rated pressure of 1500 psi.

Use of the pumps as hydraulic motors is also detailed and performance curves in the use are furnished. Engineering drawings and specifications round out the publication.

(Cat 111 is issued by Tuthill Pump Company, 951 E. 95th St., Chicago 19, Ill.)
Circle 2094 opposite last page.

Details DC drives

Two booklets of 14 pages each give all details on line of adjustable-speed, DC packaged drives. Units feature static power-conversion.

Drives are available in two forms — Ultraflex E, 1 to 40 hp electronic adjustable speed drive; Ultraflex M, 1 to 200 hp magnetic amplifier adjustable speed drive.

(Booklets on DC packaged drives are available from Cutler-Hammer Inc., 384 N. 12th St., Milwaukee 1, Wis.)
Circle 2095 opposite last page.

Torque wrench manual of fundamentals

Manual with 28 pages discusses torque principles in detail, torque wrench types, signaling devices, attachments and adapters, and formulas and computations.

Well illustrated with drawings on each point, manual is easy to follow. Illustrated with several charts such as bolt stud loads, and a torque specification chart.

(Torque Manual is available for $1.50 from P. A. Sturtevant Co., Addison, Ill.)

Pictures transistorized voltage regulators

Complete standard line of transistorized electro-mechanical automatic voltage regulators is pictured and described in 12-page bulletin. Units are listed for ratings from 2 to 100 kva for 115, 230 or 460 volt, 50/60 cycle, single or three phase service.

(Bul S358EMT is issued by The Superior Electric Company, Dept EMTB, Bristol, Connecticut.)
Circle 2096 opposite last page.

Shows saturable reactors

Bulletin shows portion of line of saturable reactors for controlling and regulating any amount of AC power from 1 to 3000 kva, single or three phase, at any voltage.

(Bul 658 is issued by Sorgel Electric Co., 838 W. National Ave., Milwaukee 4, Wis.)
Circle 2097 opposite last page.

Measure smoke density continuously

Smoke density measurements are electrically transmitted to remote indicators or recorders, or both, by a transmitter described in this four-page bulletin.

Details of radiant energy detection principle of operation are provided along with installation drawings and wiring diagrams.

(Bulletin E66-1 is available from Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio.)
Circle 2098 opposite last page.

Hydraulic fundamentals reference manual

New revision of an old standard, Hydraulic Fundamentals and Industrial Hydraulic Oils, has been released. This 44-page book is a practical introduction to hydraulic system principles with illustrated explanations of different types of valves, pumps, motors, torque converters, and accessories.

Explanation of important oil characteristics is followed by sections on oil selection and trouble shooting.

(Bulletin B-4 is available from Sun Oil Company, Philadelphia 3, Pa.)
Circle 2099 opposite last page.

Describes powder lancing with case histories

Starting with a brief history of powder lancing, this eight-page booklet shows how the process is used in the steel and construction industries to lick jobs that would otherwise be lengthy or economically impossible.

Actual case histories are cited in which the process saved production time in furnace maintenance work and was used to shape and demolish thick concrete in situations where conventional methods were impossible.

(Bulletin F-1164 is available from Linde Company, Room 2840, 420 Lexington Avenue, New York 17, N.Y.)
Circle 2100 opposite last page.

For more information on items reported in the New Literature section circle corresponding numbers on reader service card opposite last page.

Fire protection story

Forty-two pages of photographs and information give story on four types of fire-protection systems — water spray, foam, carbon dioxide, and dry chemical.

Numerous case histories covering all four types are presented. Emphasis is placed on handling special hazard situations.

("Special Hazard Fire Protection" is available from Grinnell Company, Inc., Providence 1, R.I.)
Circle 2101 opposite last page.

All about coatings

Eight-page booklet describes line of durable, baked-on phenolic, epoxy and other protective coating materials for industrial equipment.

(Protective Coatings and Linings booklet is issued by Lithcote Corporation, 5000 W. Lake St., Melrose Park, Ill.)
Circle 2102 opposite last page.

Specifies multiple-disc relief valves

Eight-page bulletin gives features of multiple-disc relief valves for steam systems. Specifications for vertical, horizontal and angle styles in sizes from 4 to 48", and for pressures of 0-25 to 0-100 psig, installation diagrams, and data on selecting are included.

(Bulletin 5200-A is issued by Cochrane Corporation, 17th St. & Allegheny Ave., Philadelphia 32, Pa.)
Circle 2103 opposite last page.

In the market for a classifier?

Catalog on wet classification consists of 24 pages of information about the construction and application of classifiers, hydro-separators, washers, and heavy media separators. Also includes combined grinding and wet classifying flow sheets.

Several pages are devoted to a belt type classifying device with a new sand cleaning feature, which has proved itself in the field.

Specifications are given for each type of unit.

(Bulletin 39-C is available from Hardinge Company, 240 Arch Street, York, Pa.)
Circle 2104 opposite last page.

Drafting room procedure short cuts

Booklet outlines ways in which reproduction materials can provide short cuts and savings in reproduction departments, drafting rooms, and in the field.

Cites seven applications, including protection of original drawings, simplified print distribution, restoring old worn drawings, reproducing blueprints and direct-process prints, speeding drawing revision, and combining standard designs.

(Bulletin F1-232 is available from Eastman Kodak Company, Graphic Reproduction Division, Rochester, N.Y.)
Circle 2105 opposite last page.

When TUBE MAINTENANCE is the problem . . .

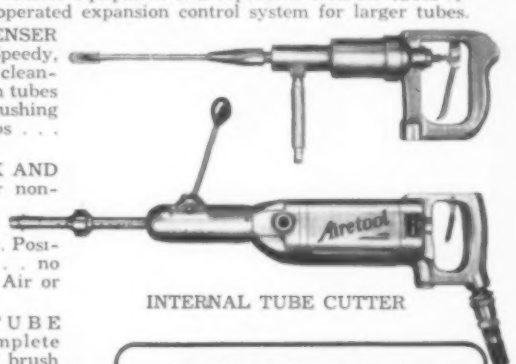
AIRETOOL has the answer

Air-powered tools for solving the toughest tube maintenance problems efficiently and economically.

FASTER TUBE ROLLING with the new Airetrol Tube Expansion Control. Just set dial and torque sensing cam automatically stops expansion to .001" accuracy. Air-motor equipment and expansion tools for tubes ¼" to 1½". Electrically operated expansion control system for larger tubes.

EFFECTIVE CONDENSER TUBE CLEANER Speedy, lightweight tool for cleaning hardest scale from tubes up to 1". Built-in flushing system removes chips . . . keeps drill cool.

CUT TUBES QUICK AND EASY Cuts steel or non-ferrous tubes through tube sheets up to 4" thick. Positive feed control . . . no gouging or burning. Air or electric motor.



INTERNAL TUBE CUTTER

POWERFUL TUBE CLEANERS A complete line of cleaners and brush heads for straight or curved tube maintenance.

Write for literature on any Airetool equipment or contact your Airetool representative for assistance on tube cleaning problems.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Puerto Rico, Italy, Japan, Hawaii.
EUROPEAN PLANT: Vlaardingen, The Netherlands
CANADIAN PLANT: 37 Spalding Drive, Brantford, Ontario

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge.

Circle 2106 opposite last page

Consider radial loads in pump design

Causes of radial loads, how to measure them, and how their effects are controlled is the subject of this eight page bulletin.

Cause, effect, and cure of damaging radial thrust forces on pump impellers, bearings, wear rings, seals and stuffing boxes, and the shaft itself are thoroughly discussed. Formulas and diagrammatic explanations of the design and production applications are presented.

(Bulletin No. EM-79 is available from Peerless Pump Division, Food Machinery and Chemical Corporation, 301 West Avenue 26, Los Angeles, California.)
Circle 2107 opposite last page.

Corrosion table for PVC linings

Handbook on PVC linings pays specific attention to individual characteristics of conventional flexible lining, non-toxic white PVC flexible lining, and unplasticized PVC lining.

Table compares both conventional and unplasticized linings in terms of their resistance to a wide range of acids, alkalis, salts, plating solutions, organic compounds and several liquids. Materials are evaluated at 70, 120, and 160°F.

(Catalog LC-58 is available from Kaykor Industries Inc., Division of Kaye-Tex Mfg. Corp., Yardville, N. J.)
Circle 2108 opposite last page.

Explains silicone-insulated motors, transformers

Over 20 photographs and eight pages of information tell story of silicone insulating materials for motors and transformers. Several brief reports from actual applications are included.

(Silicone Insulated Motors and Transformers Bul is issued by Dow Corning Corporation, Midland, Mich.)
Circle 2109 opposite last page.

Know your facts about water conditioning

Twenty-page bulletin describes latest manual and automatic water softeners, dealkalizers, deionizers, and filtration equipment for processing and feedwater applications.

Also covers zeolites, ion exchange resins, and water treating chemicals. Illustrated with sectional and flow diagrams.

(Bulletin 611C is available from Elgin Softener Corporation, Elgin, Ill.)
Circle 2110 opposite last page.

Charts and tables about heating, ventilating

Redesigned line of heating and ventilating units are described in this bulletin. Separate sections are devoted to major components such as coils, fan sections, and accessories.

Construction details and significance of sectional construction are explained.

Complete tables are presented for steam heating capacities, hot water heating capacities, and fan capacities. Also included are air friction tables, filter data, and recommended selection procedure.

(Bulletin 8927 is available from American Blower, Division of American Standard, Detroit 32, Mich.)
Circle 2111 opposite last page.

Hydraulic hose, fittings for high pressure

Rubber covered double wire braided hose and reusable fittings are covered in recently issued catalog.

Covers stainless steel braided hose and perforated cover hose for coal shooting.

Construction, recommended service, and temperature range are listed for each type along with full specifications.

(Catalog 4430 is available from Parker-Hannifin Corporation, 17325 Euclid Avenue, Cleveland 12, Ohio.)
Circle 2112 opposite last page.

Protect motor circuits against shorts

Fundamentals of selective short-circuit protection for motor circuits are covered in eight-page bulletin.

Reviews features and applications of an instantaneous magnetic trip device recommended for use in series with, and directly ahead of, proper motor-running overcurrent trip device.

Includes two pages of data on frame sizes, their respective instantaneous trip ranges, and suggested trip setting positions for various horsepower motors.

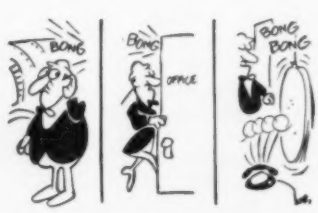
(Bulletin No. 5040-A is available from the I-T-E Circuit Breaker Company, Small Air Circuit Breaker Division, Philadelphia 30, Pa.)
Circle 2113 opposite last page.

Dependability in automatic metering

An automatic metering system and what it does is fully discussed in this twelve page bulletin. Describes the function of its exclusive automatic resetting control head, which is connected to the meter by a direct drive.

Shows typical hook-ups and suggests where each might be applied. Includes a section on accuracy and how these meters are tested before shipment. Several installations are used as illustration.

(Bulletin FL-56 is available from Hetherington & Berner Inc., 701-745 Kentucky Ave., Indianapolis 7, Ind.)
Circle 2114 opposite last page.



Electronic recorder info

Bulletin and specification sheet of two pages each tell complete story on electronic recorder. Instrument will accept AC or DC, high and low impedance, isolated and non-isolated, between 10 and 100 mv with sensitivity of ±0.1%.

Maximum of four linear records on one chart is possible.

(Publications 57-1190-47 & 58-1223-41 are issued by The Hays Corporation, Michigan City, Ind.)
Circle 2115 opposite last page.

Gives inside info on digital systems

Eight-page bulletin describes and illustrates data-gathering equipment for measuring process variables. Data are received and displayed in digital form.

(Bul E72-1 is issued by Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio.)
Circle 2116 opposite last page.

How to stop foaming

Four-page brochure describes two types of antifoaming agents for controlling foaming and carryover in steam boilers. Both liquid and dry forms are available.

(Brochure HSP-905 is available from Dept 410, Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, Pennsylvania.)
Circle 2117 opposite last page.

Will give proportioning of dampers and valves

Electronic motor-operators designed for proportioning control of dampers or valves in heating, ventilating, and air conditioning systems are illustrated and specified in two-page data sheet.

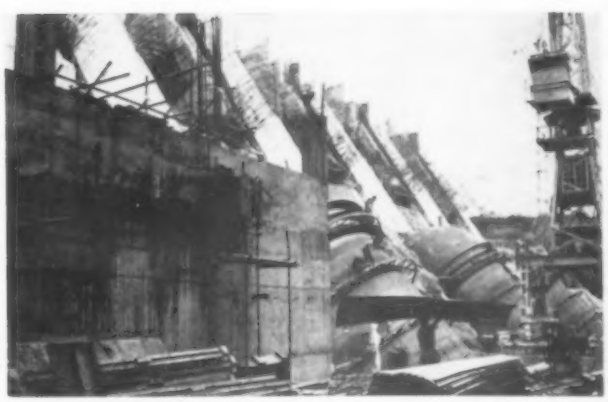
(Data Sheet F 8519 is issued by Barber-Colman Company, Rockford, Ill.)
Circle 2118 opposite last page.

PHOTO NEWS

INSIDE AN OPEN HEARTH, engineer peers up at the 8 x 8 foot waste gas flue which makes this one of the largest furnaces at Inland Steel's Chicago plant. Seat and damper for the 320-ton, seven-door furnace's gas system was designed by Blaw-Knox.

MACKINAC AT NIGHT shows the lights that required 19 miles of conduit, 140 miles of wiring. Sharing this wiring: traffic control, phone lines, air and marine navigation lights.

COMPUTER CONFAB — Operating engineer types instructions to the computer at Louisiana Power's Sterlington Station. It will tell him what's happening at 350 points around the plant. Inset shows gold-plated taper pin connectors used to connect transistors within the computer.



MACAGUA DAM, VENEZUELA will be operating late this year. First of the six turbines are shown being installed. They'll supply 50,000 kw for a nearby steel mill. Final capacity of the dam will be 300,000 kw.

59-TON STATOR for Portland General Electric Company in Oregon is shown during winding at Westinghouse's Sunnyvale, Calif., plant.

Dissolved O_2 analyzer works continuously

Two-color bulletin gives comprehensive information on an oxygen analyzer that is designed for continuous automatic analysis of dissolved oxygen in high purity water.

Information includes applications, specifications, principles of operation, improved features. Also contains a mounting dimension diagram, a schematic diagram, and photographs of the instrument.

(Bulletin O-4014 is available from Beckman/Process Instruments Division, Fullerton, California.)
Circle 2119 opposite last page.

Multi-tube line works like BX

Describing a multi-tube pneumatic or hydraulic transmission line, four-page bulletin shows sizes, methods, specifications. Tubes of ¼ to ½ inch can be bundled in the armored cable. Flexible, the cable installs much like BX.

Up to 19 tubes are contained in the cable. A variety of armored coverings are available.

(Product Specification G91-9 is available from Bailey Meter Company, 1050 Ivanhoe Rd., Cleveland 10, Ohio.)
Circle 2120 opposite last page.

Hot gas washing with single unit

Two-color bulletin explains how hot gas washer incorporates five methods of hot gas collection in a single compact unit.

Also describes operation and lists features that make unit ideal for all dust laden problems. Isometric drawing is used to illustrate washer's operation. Complete specifications are given for seven models.

(Bulletin L-2 is available from Lehigh Fan & Blower Division, Fuller Company, Catasauqua, Pa.)
Circle 2121 opposite last page.

Centrifugal precipitator requires less space

Bulletin describes a centrifugal precipitator with drawings and photographs to show construction, dimensions, and different arrangements.

Medium efficiency, low pressure drop precipitator is used for primary dust collectors in pneumatic conveying, primary dust collection where atmospheric pollution will not be a problem, and reduction of dust loading to final collectors.

Advantages and specifications of 13 sizes are listed.

(Bulletin 276 is available from American Air Filter Company, Inc., Louisville, Kentucky.)
Circle 2122 opposite last page.

Use available power with a duplex pump

Duplex steam-driven liquid pumps are described in detail in this bulletin. For boiler feed or other fluid pumping, these piston-packed pumps deliver variable volume as needed at constant pressure.

Describes choice of construction materials available, ranging from bronze fitted to all iron or all bronze fittings. Performance and dimension charts describe twelve sizes and a cutaway view shows construction details.

(Bulletin No. 202-41 is available from American-Marsh Pumps, Inc., Battle Creek, Mich.)
Circle 2123 opposite last page.

Explains heat diffuser

Brochure explains and illustrates typical uses of direct-fired heat diffusers in which space-heating plant is featured as central system for schools, churches, warehouses, factories, and in manufacturing processes.

(Cat 46 AF 91 is available from Unit Heater Dept., Carrier Corporation, 300 S. Geddes St., Syracuse 1, N.Y.)
Circle 2124 opposite last page.

Here's how to save cost of a new roof

Either wet or dry roofs present no problem to this resurfacing product. Bulletin explains how air-blown asphalt and a special additive provide perfect adhesion between coating and roof.

Shows symptoms of failing roofs and explains why roofs fail. Gives coverage figures for various types of roof.

(Bulletin 171 is available from National Asphalt Corporation, Bulkley Building, Cleveland 15, Ohio.)
Circle 2125 opposite last page.

Shows electric motor with air-cooling

Redesigned line of totally enclosed electric motors with air-to-air heat exchange system is portrayed in eight-page bulletin. Motors are equipped with capsule-mounted split-sleeve bearings.

(Bul 51B8991 is available from Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis.)
Circle 2126 opposite last page.

Protects those gages if pressure jumps

Two-page bulletin describes device that will automatically and instantly isolate gage if system pressure exceeds top gage-reading. Design and technical data are given.

(Form 6S-2237 is issued by Circle Seal Products Co., Inc., 2181 East Foothill Blvd., Pasadena, Calif.)
Circle 2127 opposite last page.

Weather-protected motors colorfully portrayed

Four-page bulletin explains line of weather-protected motors, available at 250 hp and up. Main features are covered in four-color illustrations.

(Bul GEA-6721 is issued by General Electric Company, Schenectady 5, N.Y.)
Circle 2128 opposite last page.

You need dependability in pump and heater sets

Individually engineered pump and heater sets that meet exact field conditions are described in this four-page bulletin.

Explains why dependability is a must, and discusses features of line that is engineered for each particular application.

Includes table of oil temperatures for pumping and atomizing, and shows a typical flow diagram.

(Bulletin PS-57 is available from Coen Company, 40 Boardman Place, San Francisco, California.)
Circle 2129 opposite last page.

Describes governor

Two-page bulletin describes close-limit controlling governor for excess pressure service in boiler feeding, differential reducing valve service on motor-driven pumps, or for constant pressure service to 150 psig.

Suggested hook-ups and mechanical features are illustrated.

(Bul #1046 is issued by Copes-Vulcan Div., Blaw-Knox Company, Erie 4, Pa.)
Circle 2130 opposite last page.

The inside story on cooling towers

This sixteen page bulletin is crammed full of cross-sectional drawings that show the construction details of induced draft, counter flow cooling towers.

Includes sections on framework, basins, fan deck and throat, filling, distribution systems, drift eliminators, louvers, mechanical features, casing, and tower access. Lists all specifications and sizes available, and includes photographs of installations for several applications.

(Bulletin No. 4.9.080A is available from J. F. Pritchard & Co. of California, 4625 Roanoke Parkway, Kansas City, Missouri.)
Circle 2131 opposite last page.

How L. I. Lighting collects flyash

Eight pages of information and dozen illustrations describe recently installed dust collection system at Long Island Lighting Co.'s E. F. Barrett Station.

System comprised of 48 cyclones and two giant twin-section electric precipitators collects nearly 5 tons flyash per hour.

(Booklet on Long Island Lighting dust collection is available from Buell Engineering Company, Inc., 123 William Street, New York, New York.)
Circle 2132 opposite last page.

How to select silicone insulated cables

Discussed in separate sections of book on silicone rubber insulated cables are individual specifying factors including performance data, service life and physical properties, electrical characteristics, and suggested applications.

Charts, photographs, and ASTM specifications are included.

(Book on "Nepco-Sil" Cables is available from Advertising Dept., National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.)
Circle 2133 opposite last page.

How to achieve full heat in steam traced lines

Four-page bulletin shows how to achieve the effects of full steam jacketing using steam tracing lines. Pictures show method as used for reciprocating pump, pipes.

Comparative data shows warmup time for full-jacketed and steam traced lines with a third curve describing how close full jacketing can be approached by this method.

(Bul 200 is issued by Thermon Manufacturing Company, 1017 Rosine St., PO Box 1961, Houston, Tex.)
Circle 2134 opposite last page.

Pumps abrasives

Data and specifications are given on 35 of the more than 60 size combinations in line of pumps designed to handle abrasives and corrosives. Horizontal-shaft, single-stage, end-suction pumps are available in three basic designs.

(Bul "K" is issued by Nagle Pumps, Inc., 1219 Center Ave., Chicago Heights, Ill.)
Circle 2135 opposite last page.

Interested in cutting unloading costs?

Six-page bulletin tells how car shaker saves time, labor, and money. Cites tests, where a shaker unloaded hopper bottom cars in less than six minutes.

Shows three basic types of installation, with photographs of each, and lists users.

(Bulletin "Money Making Machine" is available from National Conveyor and Supply Company, 345 N. Harding Avenue, Chicago 24, Ill.)
Circle 2136 opposite last page.

Halts Fouling

(*Continued from page 11*)

ual inspection here is one advantage of this scheme.

Water (at 40 to 60 gpm) is discharged into trough at the same point. This is in addition to water which is raining down from the tower fill. Made of lead sheathed redwood, this trough is slightly pitched toward a perforated section from which diluted acid drips into tower's basin. Eleven lead baffles along trough's length guarantee thorough mixing.

Control action is taken by altering pump stroke. This is done with a roundchart recorder and controller. pH is taken with glass electrode, reference electrode, and temperature-compensating probe in plastic cell.

To insure safety of opera-

NON-FLUID OIL
TRADE MARK REGISTERED

PREVENTS OIL-SOAKED INSULATION

Oil-soaked insulation, caused by ordinary oil, is eliminated when you use NON-FLUID OIL. It allows motors to run longer, cooler and cleaner.

NON-FLUID OIL lasts longer in every type of equipment because it remains where applied until entirely consumed, providing better lubrication at less cost per month — per year.

Proof is in performance. Results show NON-FLUID OIL pays for itself many times over. Send now for a free testing sample and informative bulletin No. 504.

NEW YORK & NEW JERSEY LUBRICANT COMPANY
292 MADISON AVE., NEW YORK 17, N. Y.
WORKS: NEWARK, N. J.
WAREHOUSES

Birmingham, Ala. — Greenville, S. C. — Greensboro, N. C.
Atlanta, Ga. — Chicago, Ill. — Detroit, Mich.
Columbus, Ga. — Springfield, Mass. — Providence, R. I.
Charlotte, N. C. — St. Louis, Mo.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

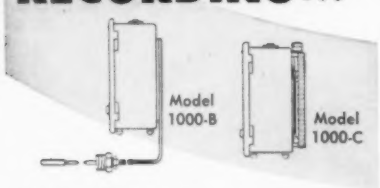
Circle 2137 opposite last page

Have you moved?

If you have recently changed your address or your job, you will want to continue receiving POWER INDUSTRY just the same. Drop a line, giving your name, your new title and address, and your old title and address, to

Reader Service Dept.
POWER INDUSTRY
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

TEMPERATURE RECORDING...



Charts the truth about Temperature

Auto-Lite model "1000" Recorder has capillary tubing for remote reading, easily observed 6" chart . . . Various standard ranges from minus 40°F to plus 550°F . . . Wall mounting, portable or portable self-contained types . . . Electric or mechanical chart drive . . . 24-hr. or 7-day cycle . . . Priced as low as $49.50.

NEW! Auto-Lite TRANSISTORIZED Recorder, Model "2200" . . . charts temperature cycles without the use of ink. Priced from $73.

THE ELECTRIC AUTO-LITE COMPANY
INDUSTRIAL INSTRUMENT DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONT.

Send for Latest Catalog . . . showing many Auto-Lite thermometer types.

TEMPERATURE RECORDERS AND INDICATORS

Circle 2138 opposite last page

tion, safety switch shuts acid pump off whenever pH drops to a predetermined level. This protects metal from corrosion.

In addition, alarm contacts are set 0.4 pH units either side of pH setpoint. Operating practice calls for upsetting system once a day by changing pH setpoint so that operator can be sure system is working properly.

Results: This system has worked so successfully that it has been adopted at three stations. pH can be held within 0.1 pH unit of the setpoint. No violent changes occur in normal operation — control is a throttling action.

Practically no trouble has cropped up with pH measuring equipment. Very little maintenance has been required. Recorder is checked daily against a lab meter and adjustment is made if necessary. pH cells are located in the laboratory in two of the stations. Here they are accessible for checking.

At Ripley station, where system was installed in January, 1954, mechanical cleaning has not been needed — deposits have disappeared. While there is still a black varnish-like coat of manganese on tubes, deposits elsewhere have been gradually disappearing and large deposits are gone.

(pH control equipment for Ripley Station was furnished by Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.)

Circle 2139 opposite last page.

Classified Advertising

"FASTER FROM FOSTER"
RAIL
& ALL TRACK EQUIPMENT
Nation's Largest Warehouse Stocks
L. B. FOSTER CO.
PITTSBURGH 30 • ATLANTA 8 • NEW YORK 7
CHICAGO 4 • HOUSTON 2 • LOS ANGELES 5

advertisers' index

A

Airetool Manufacturing Company 29

B

Buell Engineering Company, Inc. 5

C

Cobra Metal Hose 9
Crane Co. ..... 4th Cover

E

Electric Auto-Lite Company, The, Industrial Instrument Division 34

F

Fairbanks, Morse & Co. 3rd Cover
Federal Sign and Signal Corporation 25

G

Globe Company, The, Products Division 4
Graphic Systems 14

H

Hewitt-Robins 27
Hungerford & Terry, Inc. 27

I

Illinois Water Treatment Co. 5

J

Johnson Corporation, The 25

N

National Airoil Burner Company, Inc 23
National Boiler Protector 14
Neff & Fry 9
New York & New Jersey Lubricant Company 33

P

Pickands Mather & Co. 21
Putman Publishing Company 8, 10

R

Ruppright's Rotary Roof Cooler 9

T

Tuthill Pump Company 10

V

Vogt Machine Company, Henry ..... 2nd Cover

W

Wickes Boiler Co., Division of The Wickes Corporation 6-7

Advertising Representatives

RICHARD H. PUTMAN — Sales Manager

FRED S. BRANDT — *Eastern Sales Manager*

CHICAGO 11, ILLINOIS, Richard H. Putman, Fred D. Schenck, 111 East Delaware Place, WHitehall 4-6141

CLEVELAND 9, OHIO, Fred S. Brandt, 5414 Archmere Avenue, SHadyside 1-9452

LOS ANGELES 57, CALIFORNIA, Bob Wettstein & Associates, Walter P. Greenwood, 672 S. Lafayette Park Place, DUnkirk 8-2286

NEW YORK 17, NEW YORK, Fred S. Brandt, William J. Prohovich, 369 Lexington Avenue, MUrray Hill 6-7738

PORTLAND 5, OREGON, Bob Wettstein & Associates, 337 Pittock Block, 921 SW Washington St., CApitol 8-4107

SAN FRANCISCO 8, CALIFORNIA, Bob Wettstein & Associates, Jerry Nowell, Gene Watts, 355 Stockton St., YUkon 2-9537

SOUTHEASTERN STATES, Joe H. Howell, 40 Peachtree Place, N.W., Atlanta 9, Georgia, TRinity 2-2235

THAT'S INTERESTING

Planes fly without fuel — maybe soon

Aircraft that fly through the upper atmosphere without fuel have been envisioned by Sterge T. Demetriades and Dr. Carl B. Kretschmer, research chemists with Aerojet-General.

Ranging in size from featherweight metal-foil kites to manned chemical factories, planes would be propelled by jets operating on the chemical energy of thin air at altitudes above 60 miles.

Success will depend on the speed with which single oxygen atoms in the upper air can be made to pair off to form molecules of oxygen gas.

Preliminary design of a ramjet atomic-oxygen power plant has been carried out in detail. Thrusts can be achieved that compare favorably with expected frictional drag at these altitudes.

Complete picture

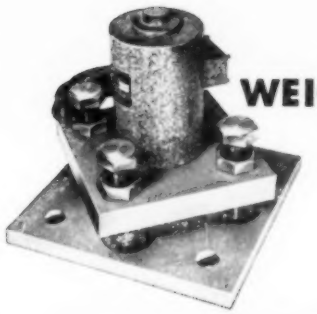
A private "rogues' gallery" is helping Kearney & Trecker Corp., of Milwaukee, keep track of apprentice training. "Apprentice Development Board" contains all up-to-date information supervisors need to fill job openings.

Since plant's apprentices usually number between 80 and 90, considerable time is saved because there's no need to consult numerous files and records.

Power from way down

They were looking for sulfur deposits at El Pilar, Sucre State, Venezuela, but the drill bit too deep and uncovered a natural source of underground steam.

Venezuelan Sulphur Corp. is now working toward utilization of the steam to generate electric power. It has been estimated that as much as 400,000 kilowatts may be produced.



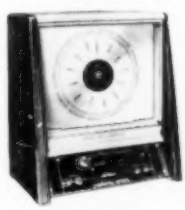
WEIGHING... BATCHING...

Fairbanks-Morse Scales Offer New Economy, Accuracy, Speed...Electronically!

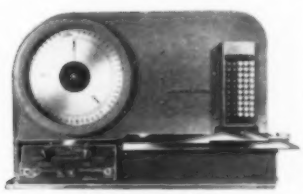
Belt conveyor scale and instrument

Read-out to auto-typewriter or tape

Punch card operated sequence batcher



Desk instrument for weighing



Desk instrument for weighing and printing

Sequence batcher for manual programming

Even Adapts to Present Mechanical Systems

Fairbanks-Morse electronic control and instrumentation permits remote location of weight recording instruments...assures automatic balance detection...automatic ranging without drop-weights...automatic zeroing...pushbutton recording and much more.

This same electronic control of weight measurement can be employed to streamline your batching operation. You can select precise quantities of all materials...in proper sequence...at the push of a button. Or you can put the batching formula on a punch card and do the whole job automatically.

Weight readings can be fed to automatic typewriters, adding machines, tape punchers, etc. Chances are your present lever system can be converted to electronic operation.

For more information write today for new literature. Fairbanks, Morse & Co., 600 S. Michigan Avenue, Chicago 5, Illinois.

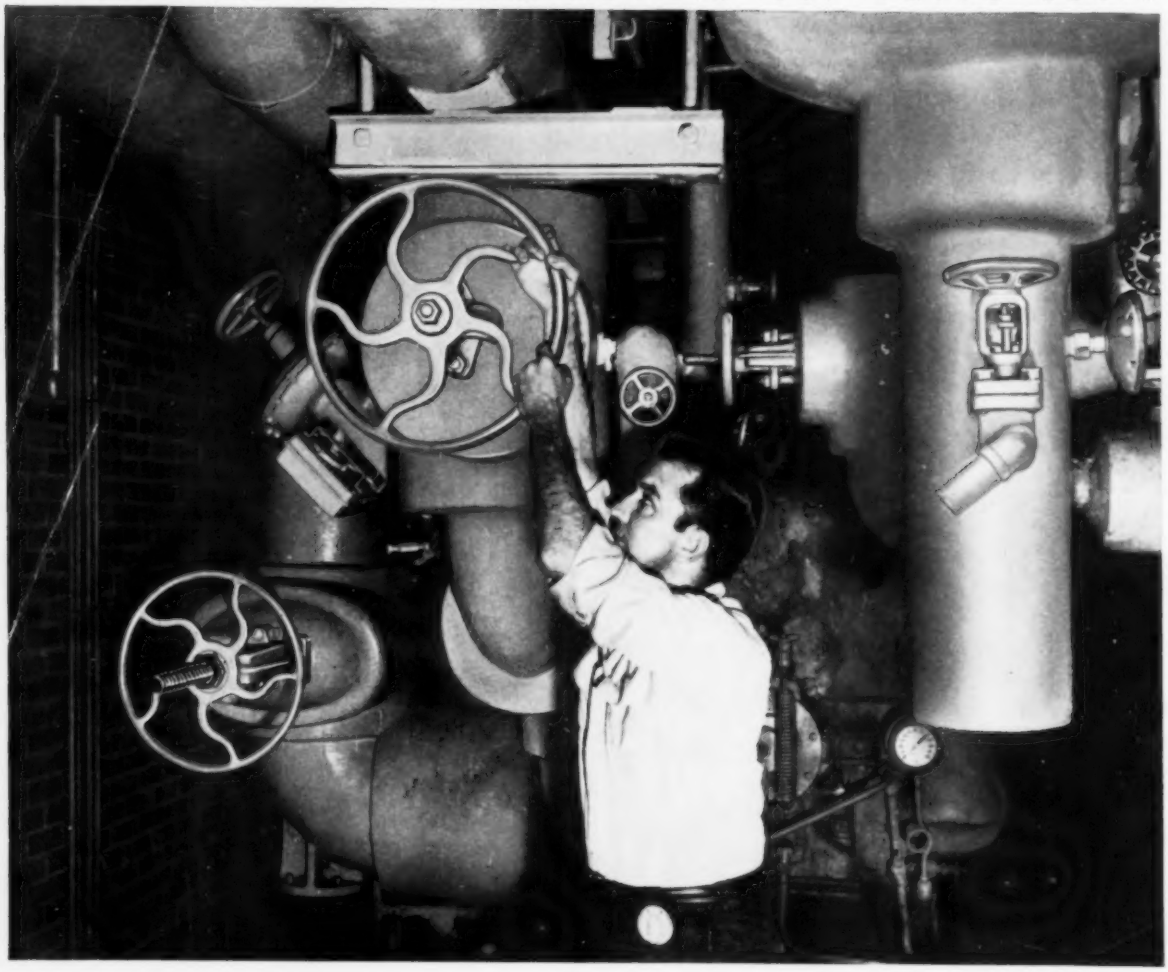
FAIRBANKS-MORSE

a name worth remembering when you want the BEST

SCALES • PUMPS • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

Circle 2141 opposite last page

Cities Service shows how to cut valve costs



Crane globe valve in 14th year on steam turbine line

Cities Service Refining Corp. uses hundreds of valves at its Lake Charles, La., plant. Maintenance and replacement costs could be staggering, but for careful control of valve selection.

For example, the Crane 6-inch, 300-pound steel globe valve shown above was installed at the Lake Charles plant 14 years ago. Working at 250 psi., 600 deg. F., the valve is used in the steam line to a turbine-driven feed-water pump.

In spite of its operation 3 or 4 times a week, this sturdy Crane valve has continued tight in service and has required no repairs in 14 years!

Thrifty buyers want no better reward than the kind of cost-cutting, dependable service they get when Crane valves are installed.

That's why in the petroleum industry, as in all industries, you'll find more Crane valves used than any other make.

This is the valve used on installation above. CRANE 151XR, 300-pound cast steel globe valve for 850° F. maximum temp. Sizes: 2 in. to 8 in. For full details, see your Crane Representative, or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Circle 2142 opposite last page

POWER INDUSTRY

Putman Publishing Company

CREATORS OF

Putman-Style

MAGAZINES

. . . featuring all these essential elements:

- TERSE VITAL EDITORIAL
- HAND-PICKED CIRCULATION
- "EXECUTIVE" FORMAT
- HIGH VISIBILITY
- QUALITY READERSHIP
- MORE READER ACTION